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Hamilton P. Traub

Harold N. Moldenke

THE AMERICAN PLANT LIFE SOCIETY
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21st issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California

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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 138.]

PREFACE

The 21st issue of Herbertia, the yearbook of the American Amaryllis Society, is dedicated to Dr. Robert F. Hoover, who received the 1955 Herbert Medal Award for his outstanding contributions toward the advancement of the amaryllids. Dr. Hoover straightened out the taxonomy and nomenclature of the BRODIAEA LILIES. Prior to the publication of Dr. Hoover's contributions, some of these plants paraded under various names, but now the gardener can rest assured that few if any future name changes will be required. This example shows the value of basic research to the gardener.

Dr. Hoover contributes a charming autobiography, and an article on recent advances in the field of the BRODIAEA LILIES. It is appropriate that the cover design is based on the spectacular FIRE-CRACKER LILY, one of the BRODIAEA LILIES. This can be forced like Narcissus, tulips and hyacinths, and all that is needed is some-one to grow a sufficient stock so that all may enjoy this wonderful plant. A word of caution should be inserted here. The native flowering plants, including the FIRE-CRACKER LILY are protected by California law, and growers must therefore grow their stocks from seeds.

Articles on hybrid *Amaryllis* include—evaluation of hybrid *Amaryllis* by Dr. Thornburgh, experiences with *Amaryllis* by Nicholas T. Urhausen, reminiscences by W. E. Rice, more experiences with Dutch *Amaryllis* by John T. Weisner, 27 years with *Amaryllis* in northern Illinois by Mrs. Fred Tebban, and growing *Amaryllis* in California by J. T. Stewart. Prof. Ira S. Nelson reports on an *Amaryllis* collecting trip to South America in 1955.

There are articles on the re-discovery of *Zephyranthes concolor* by Mrs. Morris Clint, the flowering habit of *Ammocharis* by L. S. Hannibal, the cytology of *Tulbaghia violacea* by Drs. Whitaker and Flory, inheritance of seed characters in *Brunsvigia* x *multiflora* hybrids by L. S. Hannibal, multiple scapes in *Hemerocallis* by Dr. Philip G. Corliss, hybridization of Hymenocallis by Len Woelfle, the fascinating *Haemanthus* by Armyn Spies, the incomparable *Lycoris* by Sam W. Sayler. Nerines by Wyndham Hayward, and Crinums in Texas by Lenore Frels, and *Narcissus* breeding by Dr. J. S. Cooley.

There are also articles on *Amaryllis* shows in New Orleans and Mobile, *Amaryllis* school gardens by Mrs. Morton; display of *Brunsvigia* hybrids at the California State Fair, recent daylily introductions by Mr. Saxton, and other subjects. Mr. John F. Cooke, Jr., writes about the use of *Amaryllis* as an educational tool in the Cleveland Public Schools. Lt. Howard contributes charming notes on his visit with plant enthusiasts (part 1); part 2 will appear in 1956.

Mrs. Lydia Barnett, who has efficiently functioned as Membership-Secretary from 1954 to 1955, resigned due to severe illness. The writer is certain that he expresses the concensus of the members in thanking Mrs. Barnett for her excellent work in behalf of the Society, and in wishing for her a speedy recovery. Dr. Thomas W. Whitaker, of La Jolla, California, an eminent plant scientist, has assumed the duties of Executive Secretary.

During the past year, on doctor's orders, your editor had to leave the Los Angeles basin due to severe sinus trouble caused by air-pollution (smog). He has acquired a home at La Jolla, Calif., on the Pacific Ocean in a smog-free and frost-free area.

The 1956 HERBERTIA, the 22nd issue of the yearbook of the AMERICAN AMARYLLIS SOCIETY, will be dedicated to Mr. E. O. Orpet of Santa Barbara, Calif., who effectively introduced the charming hybrid Brunsvigias from Australia, particularly the outstanding white forms.

Contributors to the 1956 issue are requested to send in their articles by Aug. 15, 1955 in order to insure publication of this issue in early January 1956. Time of publication depends entirely on the receipt of the articles, and the cooperation of all toward early publication will be greatly appreciated.

March 30, 1955
5804 Camino de la Costa,
La Jolla, Calif.

Hamilton P. Traub
Harold N. Moldenke

Dedicated to

Robert F. Hoover, Ph.D.

Herbert Medalist—Robert Francis Hoover, *Ph.D.*

Plate 1

ROBERT FRANCIS HOOVER

An autobiography

Perhaps heredity determined that my life work would deal in some way with plant science, although most other people of apparently similar background are in other occupations. My father practices law, but the principal business of both his family and my mother's had been farming. Both my parents are keen lovers of nature and have always encouraged my own tendency in the same direction. Whatever merit my work may possess is largely to their credit, because of their material support during the years of my schooling and, equally important, their constant sympathy with my interests.

I was born at Modesto, California, on August 11, 1913, and grew up in the same locality. Remembrances of early years are vague, but it appears that I soon developed into a ''boy botanist.'' I was much intrigued by a copy of Jepson's ''Flora of Western Middle California'' which my mother had used in a botany course at Stanford. As far back as memory serves me clearly, probably at about seven years of age, I was familiar with the common wild flowers of the vicinity.

In the 1920's the San Joaquin Valley of California had long since lost its wild aspect of a hundred years or more ago but, even so, was the home of native plants of exceptional interest. Every spring the grainfields around Modesto offered wonderful opportunities for enjoying the clean air and warm sun in a setting which in retrospect seems beautiful beyond reality. Small depressions floored with impervious clay, where water stood following rains, were filled with the striking blue of a wild lobelia *(Downingia ornatissima)*, the rose-red of *Mimulus tricolor*, and creamy meadow foam *(Limnanthes rosea)*. Patches of sandy soil were covered with equally colorful flowers of other species. Such scenes have now vanished forever from the vicinity of Modesto, with none to mourn their disappearance. A world made for enjoyment has, it appears, been fraudulently replaced by a world to be exploited, in which the primary aim of everyone is to obtain wealth which fails to bring happiness after it is won. But such are the cynical reflections of an old mossback of forty-one winters!

Along with my appreciation of plants in the wild, there developed a desire to grow them in the garden. When I was about seven, my parents moved to a house on a half-acre lot on the outskirts of Modesto. Here my father planted fruit trees of many delightful varieties, and here I began experimenting with the cultivation of California's unique native plants. Possibly more than any of the rest, those which grow from bulbs or corms had a particular appeal for me, among them the mariposa lilies and the brodiaeas. As a mere child without any formal training in botany, I naturally thought then that all facts regarding these plants had long ago been discovered and published by botanists. I particularly

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admired Carl Purdy, who made a business of promoting the cultivation of Californian bulbs, and it was a memorable experience one summer to visit Purdy's ranch in the hills near Ukiah and actually to meet him personally.

By the time I left home to attend Stanford University, I had growing on my parents' property nearly all the native bulbs of the area covered by my limited travels in central California, as well as several other species obtained from Carl Purdy. At that time it was my ambition eventually to have an extensive farm of my own where I could experiment with plants to my heart's content. Supposedly a business similar to Purdy's could provide the financial support for such a project. These, however, were the thoughts of a boy lacking both the talent and the training for success in the highly competitive commercial world. Instinct suggested then, as experience has later confirmed, that operation of a horticultural establishment requires a great deal more than a fondness for growing plants.

The uncertain nature of my vocational aims as late as my college years is indicated by the foregoing remarks. I had no doubt about the work I wanted to do, but the process of growing up brought the realization that I should have to have some sort of employer, whose interests might be very different from mine. Gradually I came to the conclusion that the teaching profession offered the possibility of compromising between my real desires and the necessity of earning a living.

I graduated from Stanford in 1934. Although I was too immature at the time, in experience and in attitude rather than in years, to make the most of my opportunities there, I look back on my time at Stanford as a richly rewarding experience. An outstanding group of faculty members who were willing and able to give personal attention to students contributed much to it, but there was more. Most of my free time was spent in hikes over the hills, where I continued my botanical studies, now made more profitable by a background of classroom instruction. I became aware that the California flora, while being rapidly depleted by the inroads of civilization, still offered a wealth of unsolved problems for study. After 1934 Stanford's botany department ceased to exist as a separate entity, so that I was the last botany major to graduate from there.

Training for employment in some sort of botanical activity required graduate study, while monetary considerations demanded that I transfer my activity to the state university at Berkeley. The writings of W. L. Jepson had long been familiar to me, so it was natural that I should turn to him to supervise my work for the master's degree and then for the doctor's degree. My association with Dr. Jepson did much to develop my scientific attitude and to determine the nature of my interests from that time on. Jepson's death in 1947 was the occasion for the publication of eulogies (some of which qualify as such only in a euphemistic sense) by nearly everyone who had in any degree been acquainted with him. As I was able to restrain myself at the time, perhaps I may be allowed a few words now. Jepson's manner was not such as to encourage close friendship, and not all his personal qualities seemed to me worthy of imitation, but he rightly encouraged independent thought and self-reliance on the part of his students. My own tendency up to that time had been to accept the statements of recognized authorities uncritically, failing to appreciate the unsatisfactory nature of the evidence for many widely held views. On this account, it is quite possible that no other professor could have contributed so much at that time toward the development of my habits of thought and of work.

At Dr. Jepson's suggestion, I returned to boyhood scenes to write my master's thesis on the subject of the primitive flora of the San Joaquin Valley (''primitive'' here being used in the ordinary sense of original). During this time Dr. Jepson was conducting a graduate seminar on the subject of endemism, or the localization of plants in restricted areas. I became so interested that I determined to write my doctor's thesis on some phase of endemism. The area with which I was most familiar had never been studied from that point of view, and I extended my studies to the adjoining and similar Sacramento Valley to prepare a report entitled ''Endemism in the Flora of the Great Valley of California.'' My work for the doctor's degree was completed in 1937, when I was twenty-three years old.

My field trips through the San Joaquin and Sacramento Valleys were my chief source of pleasure during this period. As this portion of California had been largely neglected by plant collectors, it was not remarkable that I was able to contribute to the knowledge of the distribution of many species, rediscover some which had long been regarded as extinct, and even discover a few new species. Among the last are *Cryptantha Hooveri* Johnston, *Euphorbia Hooveri* Wheeler, and *Huegelia Hooveri* Jepson.

Although I had by this time decided that my best opportunity for useful employment was in teaching, there was in 1937 a super-abundance of recent Ph.D.'s in botany, and they were not in great demand as teachers. Dr. Jepson solved the problem by offering to employ me in research until I could find a teaching position. The pay, supplied at times by the University and at times by Dr. Jepson himself, was very low, but pride was satisfied, for at least I was self-supporting! Some of my friends even said they envied me the opportunity. Unquestionably the work was highly interesting, consisting of preparing the manuscript of Jepson's ''Flora of California.'' This work greatly increased my acquaintance with botanical literature and my ability to interpret dried plant specimens. At the same time, I continued my field studies of California plants.

It was during my employment with Dr. Jepson that I decided to review the classification of what was generally regarded at the time as the genus *Brodiaea*. During vacations I had been maintaining my plantings of ''bulbs'' (corms) at Modesto, and even adding to them. In this way I could compare living plants of the majority of the species. Approaching the problem without prejudice, I finally concluded that the group had been correctly divided into three principal genera many years earlier by E. L. Greene. Working without benefit of cytogenetics or ''cytotaxonomy'' (whatever that may be), he had reached virtually the same conclusions with regard to generic limits as those to which independent study led me. My conclusions have been published in detail elsewhere and need not be repeated here.

The brodiaeas (in the old and extensive sense), it may be explained, are fairly closely related to the genus *Allium*. Hence, although they have been traditionally referred to the Liliaceae, Hutchinson's system places them in the Amaryllidaceae. Thus it comes about that the William Herbert Medal was awarded for work on a group far less spectacular and less well known than *Amaryllis* and its nearer relatives. I am most grateful to Dr. Traub and the officers of the American Amaryllis Society, which is affiliated the American Plant Life Society for giving recognition in this way to my small contribution to the knowledge of the amaryllids.

The brodiaeas all seem small to anyone accustomed to the garden amaryllis, but I have always found them very attractive. One in particular, the Firecracker Lily *(Dichelostemma Ida-maia)*, has bright red flowers tipped with green and would be a notable addition to any garden. Most of the other species have flowers in various shades of blue or yellow. Their small size is in one way an advantage, since a number of plants can be crowded into a small space. This has of necessity always been an important consideration to me, and others who do not have a large estate at their disposal might also find brodiaeas suitable. Probably the principal reason for their general neglect by gardeners is simply the custom of planting only the same familiar things one knew in the ''old country'' or ''back east.''

While my work on the brodiaeas was in the course of publication, it appeared that the demand for teachers was increasing. In 1941 I found my first full-time job as a teacher, at the Yakima Valley Junior College, Yakima, Washington. I had never been so far away from home and in a way was disappointed not to have permanent employment in California. However, the year in Yakima turned out to be a thoroughly happy and profitable one. The cold of winter was far less uncomfortable than I had supposed it might be, and with the coming of spring the Yakima region burst into bloom with flowers I had never seen before, together with some old acquaintenances of wide distribution. My point of view as a student of plant life became greatly broadened. Every Saturday was the occasion of an excursion into the country, where I collected plants furiously. Even though a newcomer to the region, I found some plants which previously had been overlooked. One of them was named for me, *Tauschia Hooveri* Mathias & Constance. The coming of World War II (I instinctively call it *The* War) was the cause of my leaving my position in Yakima after only a year.

Having obtained regular full-time employment, I felt that I could now consider marriage. While in Berkeley, I had become acquainted with Betty Louise Brown of that city, who was to become my wife. She was sympathetic with my interests, as she still is, and frequently accompanied me on field trips even before our marriage. We were married at the end of my year of teaching at Yakima and had one happy summer together before I was called for army service. Our son, Robert Linville Hoover, was born in 1943. Lin, as he is called, showed early indications of taking after his father. At the age of three, if anyone asked him what he was going to be when he grew up, he replied, ''a botanist.'' In later years he has become more enlightened but always shows interest in any scientific subject. Field trips in recent years have generally been family outings.

During my military service I was stationed first at the University of Washington in Seattle. Later I was assigned to a hospital unit, in which I spent fifteen months in England and six months in France. War time can hardly be a happy time, especially to a man separated from his newly acquired family, but my horizons continued to expand as I became familiar with scenes I could never have otherwise viewed. Always the die-hard botanist, I tried to learn the wild and cultivated plants of every locality where I chanced to be. I count myself fortunate to have been able to visit the Royal Botanic Gardens at Kew. Also I tried to make the acquaintance of British and French botanists so far as possible.

Returning to my wife's home in Berkeley at the beginning of 1946, I began at once to search for a job. Haunting the office of the University of California employment service, I kept accepting in silence the statement of the lady in charge that there was no call for a person with my particular qualifications. At last one day I spoke up. ''Are you sure there are never any jobs I might fill?''

''Well,'' was the reply, ''there is an opening at the California Polytechnic School at San Luis Obispo, but *you* wouldn't be interested in *that!*''

I thought I might be interested in just that, and at the California State Polytechnic College, as it was soon to be known, have found opportunity for service in which my natural ability and training can be put to use. The serious business of earning a living now occupies most of my attention. Sometimes, when particularly fortunate, I am called upon to teach only botany. Among other courses over which I have presided are general zoology, genetics, bacteriology, plant and animal ecology, and agricultural bicochemistry. The difficulty of presenting these subjects adequately may be imagined.

Even so, I may be regarded as having unusual opportunities for work which gives enjoyment and enlightenment. The region of San Luis Obispo is highly interesting botanically, and much of my vacation time, days off, and field trips with classes have been given to field study and collection of plants. A grass discovered in this area and named *Agrostis Hooveri* Swallen seems to me to offer possibility of development as a cultivated forage plant for arid situations. Another newly described plant of this country, *Ceanothus maritimus* Hoover, should prove to be a desirable ornamental shrub.

Because of the war and changes of residence, most of the bulbs which I once had at Modesto have been lost. When I moved to San Luis Obispo, I salvaged a few remnants from them and again began to build up a collection of Californian bulbous plants. A move in 1953 from one house to another in San Luis Obispo set this project back, but I shall probably keep my interest in the cultivation of these plants as long as I have a little yard and can work in it. At present I have only a few species of *Brodiaea* and related genera, but this is written after only one year in our new home.

A year or so after I came to San Luis Obispo, I began to develop a new interest; namely, the cultication of cacti and other succulent plants. These plants charm me by their unusual and beautiful shapes and their exquisite flowers. Besides, as with the brodiaeas, many fine plants can be kept in a small space. I keep a rather nice collection of cacti at the college, where it serves to attract general interest and to illustrate botanical principles. Behind my back I am known to the students as "Cactus Sam."

Our home is situated on a hill in the frost-free zone (so called because cold air settles in low places) and so offers interesting horticultural possibilities. The sloping front of our lot is rapidly filling with such succulents as Crassulaceae, Mesembryanthemums, Aloes, and smaller sorts of Agaves. There are strong drying winds which do not harm such plants but would discourage more conventional sorts of flowers. Among the amaryllids, *Haemanthus coccineus* and *Nerine filifolia* are doing well and are in bloom as this is written (September).

As if there were not enough other details calling for attention, I conceived the idea of a botanical garden on the college campus. As a consequence of the fact that California Polytechnic is a state college, no funds are available for the development of such a project, but the enthusiasm of a few students and instructors gives grounds for hope. Some two years ago, administrative approval was given for the use of a portion of the campus which seems excellent for the particular purpose in view. A permanent stream flows down a narrow canyon in the hills. The steep slopes on either side are partly wooded with live oak and laurel and partly open and rocky. A few hillside seepages add to the variety of habitats which makes this area particularly suitable for its intended use. Under the circumstances, it is hardly possible that this botanical garden can develop in the same way as the more conventional sort of establishment so designated. Some visitors, expecting an intensively cultivated plot of ground with plants set out in rows, pass by the botanical garden without recognizing it. However, as an outdoor laboratory where plants can be studied in a natural environment, the area has unusual possibilities. Obviously, the native plants of California will play a large part in the development of this garden. Species native to other regions but adapted to the local climate have also been planted, with particular emphasis on xerophytes. Some outstanding students have been most cooperative in building paths and otherwise contributing time and labor. There is reason to hope that the scientific usefulness of the California Polytechnic College botanical garden will increase year by year.

My schooling ended seventeen years ago; my education, I feel, has now well begun. Teaching leaves too little time for work with plants, but who holds a job without some frustrations? What I have learned about plant life, and about life in general, during the eight years of my employment here, seems to me to outweigh all that went before. I pray that I may never lose either the desire or the ability to learn.

FURTHER OBSERVATIONS ON **BRODIAEA** AND SOME RELATED GENERA

ROBERT F. HOOVER

This series of notes constitutes a review of my previously published work on *Brodiaea* and some of the other genera which were once included under that name. Particular emphasis must be placed on the fact that further progress in the study of this group of genera will most probably be attained by the methods of cytology and, especially, genetics. A very important contribution to the cytology of these plants has been made by Dr. Madeline Palmer Burbanck, whose findings were published in two articles in 1941 and 1944. Frequent reference to her work is made in the following pages.

Information on the genetics of this group is not likely to be available soon because, for one thing, botanists with adequate training in genetics are usually employed for work on a specific project of recognized economic importance and seldom have the time and inclination for extra research in addition to their employment. Also, such investigations would require a long time, as the plants never flower before the second year and very rarely before the third year from seed. If any young geneticist should read these words, it is to be hoped that the total lack of any information on this subject will challenge him to undertake it as a life-long project.

The following discussion is arranged by genera. Under *Brodiaea* and *Triteleia,* the number preceding the name of each species indicates the order in which those species were placed in my revisions of those genera. Lack of mention of a species here indicates that no significant additional information regarding it has become available to me since the publication of my earlier studies on these genera, as listed in the references at the end of this article.

BRODIAEA

1. *B. elegans* Hoover. Burbanck reports a somatic chromosome number of 32 for this species. In view of the facts that this chromosome number is different from that of *B. coronaria* and that all plants of this complex seem to be fully fertile, it seems probable that the specimens mentioned as apparently intermediate between the two species are not true hybrids. Rather they may be interpreted as the phenotypic expression of gene combinations derived from the presumed common ancestor of the taxa included in the section *Coronariae.* [Cf. Dobzhansky (1941), p. 348 *infra*]. An extensive series of chromosome counts is needed before a more precise opinion can be expressed.

2. *B. coronaria* (Salisb.) Engler. As previously interpreted by me, this is a highly polymorphic species. There has not been sufficient new information to warrant a change in this view, but it is probable that genetic and cytological evidence correlated with field studies would at least make possible the recognition of additional varieties, and would perhaps indicate that some of the varieties should be classified as species.

A somatic chromosome number of 42 was reported by Burbanck for a plant from Corvallis, Oregon. As a collection from Corvallis was identified by me as *B. elegans,* it may possibly be questioned whether this number is universal in, or even typical of, *B. coronaria.* In any event, no other published chromosome count is unmistakably referable to this species.

At least it seems certain that *B. synandra* var. *insignis* Jepson does not belong to *B. coronaria.* As long as it remains known from the poorly preserved type collection only, it is inadvisable to publish a new name for it, but I venture to predict that if rediscovered it will prove to be a distinct and well marked species.

3. *B. jolonensis* Eastw. The expected occurrence of this species in Baja California, Mexico, is verified by a collection made 11.6 miles northeast of Sauzal on road to Guadalupe (north of Ensenada), May 23, 1941, Wiggins 10,089.

4. *B. minor* (Benth.) Wats. Working with two kinds of plants obtained from Carl Purdy, Burbanck found the chromosome number to be 12 in "*B. minor*" and 32 in "*B. Purdyi*" (using the names applied to the plants by Purdy). This difference is difficult to reconcile with oral statements made to me by both Dr. W. L. Jepson and Miss Alice Eastwood that the original collection on which *B. minor* was based is quite identical with the subsequently published *B. Purdyi* Eastwood. Also, while recognizing considerable variation within the species, I am still unable to find any externally visible character which would separate specimens into two sharply defined groups.

Two explanations may be suggested. One possibility is that the plant called *B. minor* by Purdy is a very rare species of which I have seen no specimens or have failed to notice their distinguishing features. The presence of offsets on the corms of only two of the collections referred to *B. minor* (Am. Midl. Nat. 22: 566) tends to support such a speculation.

The other alternative, suggested by Burbanck, is that the "*B. minor*" of Purdy is *B. minor* var. *nana* Hoover. If this is true, then, in view of the different chromosome numbers, the widespread existence of individuals showing all gradations between the two extremes, all apparently forming full capsules of fertile seeds, is most puzzling. The problem may eventually be solved by an extensive cytogenetic study, using plants of known wild origin, and by breeding experiments.

7a. *B. leptandra* (Greene) Baker. It was previously stated that this plant is separable from typical *B. californica* by the presence of offsets, but some corrections should be made. Corms purchased from the Carl Purdy Gardens about 1947 had offsets but produced flowers and capsules which I regard as entirely typical of *B. californica.* If *B.*

leptandra is to be given a separate taxonomic status, it must be on other grounds.

Comparison of plants cultivated at San Luis Obispo showed considerable resemblance between *B. californica* and *B. leptandra,* but the two were distinct in some features. The corms of *B. leptandra* are shallowly situated, do not have the coats extend upward to form a fibrous sheath around the underground part of the leaves and scapes, and the offsets are much more slender than in the form of *B. californica* which has them. The parts of the flower, especially the perianth-segments, are narrower in *B. leptandra.* The capsule of *B. leptandra* is distinctly more slender, and the perianth-tube enclosing it is tougher in texture and more opaque than in *B. californica.*

These differences are not intrinsically of very great significance, but since there is geographical separation and a complete lack of any evidence of interbreeding or ability to interbreed, my present opinion is that *B. leptandra* is a distinct species rather than a variety of *B. californica.*

Brodiaea leptandra, a Californian endemic of restricted distribution, has been reported heretofore only from Sonoma and Napa Counties. The following record is therefore of interest: north side of Mt. St. Helena, Lake County, June 29, 1942, Hoover 5904.

DICHELOSTEMMA

No addition or correction can be made at this time to my previously published account of this genus. Attention may be called again to the need for experimental testing of the frequently expressed opinion that *D. venustum* is of hybrid origin.

TRITELEIA

1. *T. grandiflora Lindl.* Entirely on the basis of a study of dried specimens, *Brodiaea Howellii* Wats. and *B. bicolor* Suksd. were combined and referred to *T. grandiflora* as a variety *Howellii* (Hoover, 1941). Field observation in 1942 furnished confirmation of this detail of classification. In Yakima County, Washington, *T. grandiflora* var. *grandiflora** and var. *Howellii* occupy essentially separate areas but intergrade where they occur in proximity to each other. In accordance with the almost universal practice of contemporary botanists, the two might be maintained as separate species in spite of this apparent hybridization, if the morphological difference between them were a little greater. However, in living plants as well as in herbarium specimens, the shape of the stamen-filaments seems to be the only consistent basis for distinguishing two kinds of plants, and this solitary difference is subject to intergradation. The conclusion may be drawn that the two kinds of plants are genetically compatible.

2. *T. peduncularis* Lindl. Burbanck found, in plants identified by my key as this species, chromosome numbers of 14 and 28, indicating the existence of diploid and tetraploid races. If these can be distinguished macroscopically, then unquestionably they should be separated

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* Tautonomous designation required by International Code, Article 35.

taxonomically. Burbanck has stated certain differences between them, in this manner supporting the opinion of Carl Purdy that two distinguishable kinds of plants have been referred to this species. My observations of living plants of *T. peduncularis* were admittedly limited and quite possibly involved only one of the two chromosomal races, but despite some variation I could find no means of separating the plants into two clear-cut groups, unless it might be the unusually small anthers of some specimens from Sonoma County. It is not known whether these small-anthered plants are diploid or tetraploid. The question of intraspecific classification in *T. peduncularis* may for the present be regarded as an open one, requiring more facts for a definite answer.

Assuming for the moment that it is possible to correlate other features of these plants with their chromosome number, then the question arises as to which is the true *T. peduncularis* and which requires a new name. This question is difficult to answer because, among other reasons, the two reported counts of chromosomes have not yet been correlated with the geographical distribution of the plants which they represent. Lindley's name, published in 1835, must have been based on a plant from the coastal area of California which collectors had visited up to that time, but it hardly seems possible to identify it confidently as one or the other of the two elements now known to constitute the species. One way out of the difficulty would be to designate some contemporary collection the neotype, as is authorized under the International Code of Nomenclature (Article 18), in view of the fact that the species was published before the type method had come into general use. I hesitate to take this course, however, without some knowledge as to what portion of the total distributional area of the species is occupied by each chromosomal race.

The problem has been complicated by the publication of *T. peduncularis* var. *longipedicellata* Eastw. (Leafl. West. Bot. 3: 138) without either knowledge or surmise regarding its chromosome number.

Referring to the kinds of species defined by Camp and Gilly (1943), *T. peduncularis* may exemplify either a ''phenon'' (p. 335) or a ''euploidion'' (p. 341), depending upon how readily the two segments of the species may be distinguished after further intensive study.

4. *T. laxa* Benth. Burbanck has reported somatic chromosome numbers of 28—30 and 42 for plants with large anthers, which occur principally in the coastal region of California, and of 18 and 48 for two small-anthered races of the San Joaquin Valley region. Except for the difference in anther size, cytological distinctness is not reflected in external morphology. In the course of my field work, I have at times believed that I could distinguish as many as seven forms, presumably genetic races, of this species. However, in each case herbarium specimens appeared to bridge the gaps between these variants in such a way as to make any nomenclatural segregation impractical.

The chromosome counts suggest a basic haploid number of 6. It then seems remarkable that the forms with odd-numbered sets of chromosomes should, as they do in fact, develop as many fertile seeds as the presumed octoploid. A form of apomixis may furnish the explanation. Again referring to the definitions of Camp and Gilly, *T. laxa* as now constituted may be subjected to the same two possible interpretations as for *T. peduncularis* stated above but is perhaps a better example of the euploidion. Until a complete geographic, ecologic, and cytogenetic study of variation in the species can be made, the different races may, if desired for horticultural purposes, be designated by non-technical names.

5. *T. crocea* (Wood) Greene. A remarkable occurrence of this species, or something very closely related to it, is now to be reported: 8 miles west of Weldon, South Fork of Kern River, Kern County, California, April 16, 1954, Hoover 8337. This locality is some four hundred miles southeast of the nearest place where *T. crocea* had previously been found. The plants were of local occurrence on north-facing slopes, in firm gravelly soil.

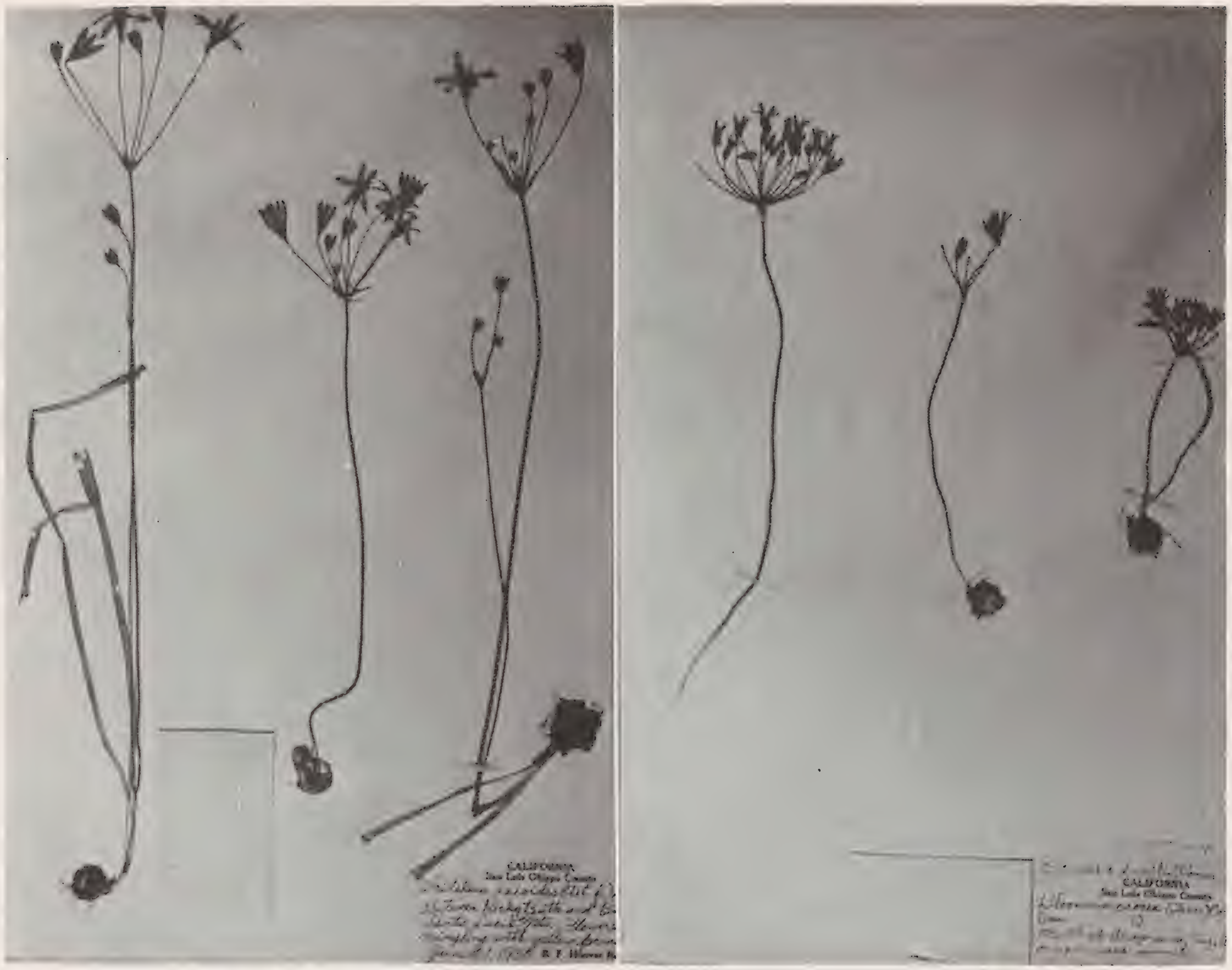
Certain discrepancies between the living plants and my description of *T. crocea* (Am. Midl. Nat. 25: 85) led me to re-examine herbarium material from the northern area of distribution of the species, and to compare it with the Kern County plants. The basal leaf in the Kern County specimens is always solitary, while the northern plants usually have two leaves. This fact, however, is not necessarily significant, because most species of the genus may have either one or two leaves, and in any event the number of leaves may depend on an environmental rather than a genetic cause. The perianth-segments were not longer than the tube in the Kern County plants, a feature which is in contradiction to my description of *T. crocea.* However, further examination of specimens shows that in some northern California plants the perianth-tube is longer than previously described. The error presumably resulted from the tendency of the perianth in dried flowers to split farther down the tube below the segments. (I have not yet seen living specimens of *T. crocea* from southern Oregon or northern California, my description being based entirely upon herbarium material).

One possibly significant difference remains. The anthers of the Kern County plants are only about 1 to 1.3 mm. long instead of 1.5 to 2 mm. long. In this respect, however, there is a close resemblance to *T. crocea* var. *modesta,* a blue-flowered plant occurring within the area of typical *T. crocea* and seemingly identical with it except in color and the slightly smaller size of its parts.

The apparent occurrence of *T. crocea* far to the southeast of its nearest previously known locality remains to be confirmed by evidence from genetics and cytology. If it is so confirmed, it will not, of course, be the only instance of a species restricted to two widely separated areas, one in the mountains of northwestern California and the other in the southern Sierra Nevada. For example, *Pinus Balfouriana* is a well known species of similar distribution at higher altitudes.

6. *T. Dudleyi* Hoover. The distinctness of this species has been confirmed by a recent additional collection: Upper Cold Spring Meadow, Peck's Canyon, Sequoia National Forest, Tulare County, California. July 29, 1950, Ferris and Lorraine 12,314.

8. *T. ixioides* (Ait. f.) Greene. In my earlier study of *Triteleia,* three different plants were included in varietal status under this name.



Type sheets of *Triteleia ixioides* var. *cookii* Hoover, *var. nov.;* and *Bloomeria humilius* Hoover, *sp. nov.*
Plate 2.

It is true that the three are in many respects very similar and difficult to separate by the usual sort of "key-characters," but there is apparently complete genetic isolation, a marked difference in physiological reaction or ecology, and, in regard to the true *T. ixioides,* rather wide geographical separation from the other two entities. These facts seem better expressed taxonomically by giving each of the three taxa the rank of species rather than that of variety.

Considering that true *T. ixioides* is found in the coastal region, easily accessible to botanists, it is rather surprising that no report on its chromosomes is available. At the southern limit of its range it intergrades with the recently discovered variety described below.

Triteleia ixioides var. **Cookii** Hoover, **var. nov.** Perianth white, purple-tinged on outside, its segments reflexed from mouth of tube [see Plate 2].
(Perianthio albo, segments reflexis).

Between Rocky Butte and Pine Mountains, Santa Lucia Mountains above San Simeon, San Luis Obispo County, California, June 21, 1950, Hoover 8010 (type, herbarium of California State Polytechnic College); Pine Mountains, May 7, 1950, Hoover 7904. Besides the extremes of var. *Cookii* and var. *ixioides,* there were also found plants which were intermediate both in flower color and in angle of divergence of the perianth-segments.

The variety is named for one of my former students, Mr. Fred L. Cook of Atascadero, California. He is "connected with it"* by first making it possible for me to reach the very interesting locality where it is found, in that way contributing directly to its discovery. I regard this plant as one of the prettiest of the "white brodiaeas" and well worth cultivation.

The occurrence of spontaneous hybridization between *T. ixioides* (section *Calliprora)* and *T. Bridgesii* (section *Hesperoscordum)* is of interest and significance. These two species occupy separate areas in nature but some years ago were planted adjacent to each other in my garden at Modesto, California. Seeds gathered from the plants of *T. Bridgesii* yielded many normal individuals of that species and two plants which must certainly have been of hybrid origin. The umbels of these two plants were similar in general appearance to those of *T. Bridgesii,* but the flowers on first opening were pale orange, later turning to pale blue. The filaments were unequal in length (a feature of *T. ixioides)* and did not expand into a deltoid base as in *T. Bridgesii,* although they still were not forked as in *T. ixioides.* The two corms in question were unfortunately lost soon after the flowers had been observed, but it should be possible again to produce this hybrid experimentally. The plants produced no seeds,—a fact which confirmed that this was a definite instance of interspecific hybridization.

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* International Code of Botanical Nomenclature, Recommendations 33A and 37A.

8a. **T. scabra** (Greene) Hoover, **comb. nov.** **Calliprora scabra** Green, Erythea 3: 126. 1895.

This species is most readily separated from *T. ixioides* by its proportionately shorter perianth-tube and the smaller average size of its anthers. It flowers a month or more earlier than *T. ixioides* when the two are grown together, and hybridization between the two is not known to occur even if theoretically possible.

I believe *Calliprora aurantea* Kell. to be the earliest published name for the species here called *T. scabra* (Hoover, 1941, p. 90), but that name has again recently been identified with *Brodiaea gracilis* Wats. (=*Triteleia montana* Hoover) by W. A. Dayton (Herbertia 7: 79. 1941). No specimen of the original collection of Kellogg's species apparently now exists in any herbarium, and its description offers no conclusive proof of its identity. The name *Calliprora aurantea is* therefore rejected as "a long-persistent source of error."*

8b. **Triteleia analina** (Greene) Hoover, **comb. nov.** **Calliprora scabra** var. **analina** Green, Erythea 3: 126. 1895.

It has previously been pointed out that *T. analina* and *T. scabra* show extremely little apparent intergradation, in spite of geographical proximity and considerable overlapping of their distributional areas. I now believe that the few individuals which are intermediate in size represent independent variants, possibly induced directly by environmental conditions, rather than true hybrids. (Cf. also Dobzhansky (1941), p. 348 *infra.)* My present opinion regarding the status of *T. analina* is supported by the difference in chromosome number reported by Burbanck: 10 in *T. scabra* as contrasted with 50 in *T. analina.*

On the whole, *T. analina* resembles the geographically separated species *T. ixioides* rather than *T. scabra.* From *T. scabra* it differs in the proportionately longer perianth-tube and smaller size of its other flower-parts, the smaller angle of divergence of its perianth-segments, the smaller average size of the entire plant, and the lack of retrorse pubescence on the scape. From *T. ixioides* it differs in the smaller measurements of all parts except, interestingly enough, the length of the filaments, and, perhaps most significantly, in its consistently smaller anthers.

Triteleiopsis

The one species of this genus, *T. Palmeri* (Wats.) Hoover, was formerly believed to be restricted to Baja California, Mexico, but has been collected at the western base of the Gila Mountains, Yuma County, Arizona, by Ripley and Barneby in 1949. This record, already published in "Arizona Flora" by Kearney and Peebles, is repeated here to complete the account of recently acquired information on this group of genera. Dr. Kearney referred the specimen to me for identification.

Bloomeria

Although Burbanck (1944, p. 344) did not express agreement with my opinion that *Triteleia* is most closely related to *Bloomeria* rather than to *Brodiaea* (Hoover, 1941, p. 74), it appears that the cytological data might be interpreted in support of my earlier view. Burbanck reported the somatic chromosome number of *Bloomeria crocea* as 18, the same number as in one of the forms which I have referred to *Triteleia laxa,* and her drawings of the chromosomes of these two plants (1944, p. 342, figs. 2 and 3) show considerable resemblance in size and general appearance.

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* International Code of Botanical Nomenclature, Article 75.

Recent study of the flowers is further informative. Descriptions of *Bloomeria* have customarily included the statement that the perianth-segments are distinct to the base, whereas *Triteleia* (or *Brodiaea* in the old inclusive sense, including *Triteleia)* has been described as having a perianth-tube. The perianth-tube, however, is very short in some species of *Triteleia* (Hoover, 1941, p. 74), and now in 1954 an examination of fresh flowers has shown that the perianth-segments of *Bloomeria crocea,* the type species of its genus, are actually joined at the base. This last statement may possibly not hold true for all specimens, but at least applies to those seen by me in the living state during this year. Furthermore, another species of *Bloomeria,* described below as new, has the perianth-segments coalescent at the base into a tube about 1 mm. long.

From these observations, the morphological distinction between *Bloomeria* and *Triteleia,* already weak, has been reduced to almost nothing. The filaments in *Bloomeria,* it is true, are described as bearing basal ''appendages,'' but the same interpretation might with equal propriety be extended to *Triteleia ixioides* and a few species closely related to it, comprising the section *Calliprora* of *Triteleia.* The term ''appendages'' has actually been used in describing the stamens of *Calliprora* (cf. Abrams, Ill. Fl. Pac. St. 1: 399), although the structures so designated are not identical with those of *Bloomeria.* The lower portion of the filament in *Bloomeria* terminates in a cup-like depression (except in the plant called *B. Clevelandii,* which is discussed further on), whereas the corresponding structure in *T. ixioides* is flattened and forked at the apex.

The stipe of the ovary, which is of variable length in *Triteleia* and absent in *Bloomeria,* remains as the most convincing morphological difference between the two genera. Possibly the best argument for separating *Bloomeria* from *Triteleia* is a geographical one. That is, *Triteleia* is of very rare occurrence in California south of Tehachapi and the Santa Lucia Mountains, whereas *Bloomeria* has its center of distribution in southern California. On the basis of these few facts, together with Burbanck's statements regarding the chromosomes, *Bloomeria* is yet maintained as a genus, although as a practical matter of identification it may be difficult for persons not familiar with the species to decide in which genus a particular specimen belongs.

Bloomeria humilis Hoover, **sp. nov.***

Mature corm 10 to 18 mm. in diameter, often forming offsets; basal leaves one or two; scape rising 5 to 8 (in one plant 15) cm. above surface

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* The photographs of the type sheets of this species and of **Triteleia ixioides** var. **Cookii** were made by Mr. David H. Thomson, to whom I hereby express my thanks.

of soil; involucral bracts ovate-acuminate, 3 to 5 mm. long; perianth golden-yellow, the tube about 1 mm. long, the segments 9 to 11 mm. long, each with purplish midrib, approximate near base, gradually curving outward; lower portion of filaments ("appendages" of authors) about 2.5 mm. long, not papillose (or sparsely so), terminating in a cup in which the upper portion is inserted and in a short blunt point on either side; upper portion of filaments about 4 mm. long; anthers about 1.5 to 1.75 mm. long; style 6 mm. long; capsule 4 mm. long [see Plate 2, right; and Fig. 1].

Cormus maturus diametro 10—18 mm. interdum propagines emittens; folia basalia unica vel duo; scapus 5—8 (interdum 15) cm. altus; involucri bracteae ovato-acuminatae 3—5 mm. longae; perianthium auratum eius tubo circa 1 mm. longo segmentis 9—11 mm. longis prope basem approximatis sensim extrorsus curvantibus unoquisque nervo medio aliquantulo purpureotincto instructo; filamentorum pars inferior (auctorium "appendices") ca. 2.5 mm. longa epapillosa (vel sparse papillosa) cullulo cuspido brevi hebeteque utroque latere instructo in quem filamentorum pars superior 4 mm. longa inserta est coronata; antherae ca. 1.5—1.75 mm. longae; stylus 6 mm. longus; capsula 4 mm. longa.

Mouth of Arroyo de la Cruz (just south of), San Luis Obispo County, California, abundant on open mesa summit, June 15, 1951, Hoover 8060 (type, herbarium of California State Polytechnic College). The species has not been observed outside the immediate vicinity and is probably a localized endemic of that part of the coast. Plants brought into cultivation have maintained their distinctness from *B. crocea*.

Examination of flowers removed from dried specimens and soaked in water indicates that the lower portion of the filaments may be smooth in some flowers, papillose in others. A careful study of the fresh flowers was not made, because the possibility of the existence of an undescribed species of *Bloomeria* was not perceived at the season when they were available.

The above description emphasizes those features which distinguish *Bloomeria humilis* from *B. crocea*. The most significant differences may be summarized thus:

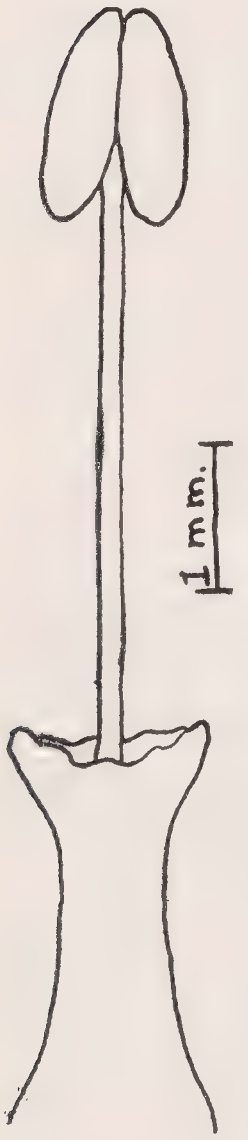

Fig. 1. Stamen of **Bloomeria humilis** Hoover, **sp. nov.**

1a. Corm never with offsets; scape rarely less than 15 cm. tall; basal leaf always solitary; perianth-segments abruptly spreading from base; lower portion of filaments papillose ....*B. crocea.*
1b. Corm often with offsets; scape rarely more than 8 cm. tall; basal leaves 1 or 2; perianth-segments approximate toward base, gradually curving outward; lower portion of filament often smooth ....*B. humilis.*

The accompanying drawing of a stamen of *B. humilis* is to be compared with similar drawings published by Ingram (1953) representing the stamens of the three varieties of *B. crocea* recognized by him.

Bloomeria Clevelandii Wats., in spite of its yellow flowers, seems to me much closer to *Muilla* than to the type species of *Bloomeria*, and accordingly I offer the name:

Muilla Clevelandii (Wats.) Hoover, **comb. nov.**

based on *Bloomeria Clevelandii* Wats., Proc. Am. Acad. 20: 376. 1885. Living material of this species was compared with the type species of *Bloomeria* and of *Muilla* through the kindness of Mr. Frank Gander, who some years ago sent me corms and fresh flowers. As here interpreted, *Muilla* differs consistently from *Bloomeria* in the larger number of leaves which are neither keeled nor channeled (in this respect resembling true *Brodiaea* rather than either *Bloomeria* or *Triteleia),* in having a short style no longer than the ovary, and in not having the lower portion of the filaments terminate in a cup-like insertion for the upper portion. It is generally stated that the pedicels of *Bloomeria* (including by implication *B. Clevelandii)* are jointed and those of *Muilla* not jointed. This distinction may be of theoretical importance and in some genera is very readily demonstrated, but is difficult to apply to actual specimens of these particular plants.

CONCLUSION

Few new details of information have been reported here. Rather, attention has been called to some puzzling problems involving a highly interesting group of plants. The solution of these problems can hardly be accomplished by one individual, however able, but answers may eventually come from the cooperative efforts of people with thorough training in various branches of botany: the student of gross morphology, the microtechnician, the cytologist, the geneticist, and the ecologist, among others.

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AMARYLLIS REPORT 1955

ROBERT G. THORNBURGH, *Chairman*
Amaryllis Committee

It is clearly evident that there is an increasing interest in the subject of amaryllis. Amaryllis in the State of California are being used in greater number and variety than ever before in landscaping. This can be seen where clivia has taken on an important place in the decorations made by the landscape gardeners around new homes. The *Agapanthus* or LILY OF THE NILE which has always been unusually hardy in Southern California is seen in increasing numbers. Though the *Brunsvigia* or Cape Belladonna has been neglected, it seems to survive and thrive beautifully without attention.

The hybrid amaryllis not being ''evergreen'' are, perhaps, less well known on that account but are beginning to thrust themselves into the limelight by their great and spectacular beauty. With the amount of publicity given the hybrid amaryllis by those who market these bulbs the nation is gradually becoming acquainted with them. The Dutch have made good use of the average American's attraction to named varieties when purchasing flowering plants. This is desirable since each gardener's expectation matches his realization when a bulb does bloom.

It should be appropriate to mention here the passing of Mr. William Edward Rice on January 20, 1955. Born in Exeter, England in 1879 and coming to the United States, he occupied himself with the production of flowering bulbs for a period of twenty-seven years. Although his greatest activity was in the production of ranunculus, he also raised hybrid amaryllis during the same period supplying Vaughn's Seed Company. Only a few of his named varieties are still in existence. Of these one of the most beautiful is 'Lady Helen' named for his most gracious wife. This quiet gentleman was active in the local Bulb Society but was otherwise not prone to make his interests in amaryllis known to many and preferred to be absorbed in his most useful daily activity, his work.

1. REGIONAL ACTIVITY AND EXHIBITIONS

NEW ORLEANS AMARYLLIS SHOW, 1954

MRS. W. D. MORTON, JR., *President,*

Garden Circle, New Orleans

The 6TH OFFICIAL AMARYLLIS SHOW of New Orleans, sponsored by the GARDEN CIRCLE, and the AMERICAN AMARYLLIS SOCIETY, was held on March 27th and 28th, 1954. The entire floor of the McMain Junior High School Cafeteria was transformed into a mass of floral loveliness—the Amaryllis shown were never more beautiful. All New Orleans Garden Clubs were represented in both the artistic arrangements and horticulture divisions. The Junior Garden Clubs, the Public Schools, and the Juniors entered fine displays. Quality Amaryllis were shown more this year than ever before—over half of the Horticulture Division was devoted to named Amaryllis clones.

Fig. 2. The Queen of the Official Amaryllis Show of New Orleans, 1954. Miss Carole Anne LeCompte (center) is crowned by Commissioner Victor H. Schiro. Maids of Honor, Misses Lorraine Centanni (left) and Miss Madelyn Paciere (right). *Photo The Times-Picayune-New Orleans States.*

The awards were made by 12 accredited Judges, and consisted of three Gold Trophies, two Sweepstakes, two Tri-colors, five AMERICAN AMARYLLIS SOCIETY AWARDS, and two Club Ribbons.

The most outstanding feature of the Show was the crowning of the Official AMARYLLIS QUEEN OF NEW ORLEANS, Miss Carole Anne LeCompte, lovely daughter of Mr. and Mrs. Calvin LeCompte. The Queen was crowned by the City Commissioner, the Hon. Victor Schiro.

Fourteen little girls formed an aisle for the Queen and her Court,—Miss Charmaine Thompson, last year's Queen, and two maids, Miss Lorraine Centanni, and Miss Madelyn Paciere. Donna Gayle Mackenroth was Crown bearer, and Lea LeCompte was Flower Girl.

[Editor's note.—After the crowning of the Queen, Commissioner Schiro called Mrs. W. D. Morton, Jr., President of the Garden Circle, and Chairman of the Show forward and presented her with a Gold Key to the City for her outstanding work in beautifying the City.]

REPORT ON THE AMARYLLIS SCHOOL GARDENS

There will be healthy competition in the 1955 Official Amaryllis Show when the six Amaryllis Gardens in the Public Schools begin to exhibit their Amaryllis from their Gardens. The P-T-A Clubs are now interested, and the Garden Circle is putting additional ladies on that Project. They have put an Amaryllis Garden in one of the Orphanages for retarded children. The McMain Junior High School retained the Gold trophy this year for their exhibit at the recent Show.

—*Mrs. W. D. Morton, Jr.*

THE GREATER GULF COAST AMARYLLIS SHOW

MRS. P. B. SKINNER, JR., *Alabama*

The annual GREATER GULF COAST AMARYLLIS SHOW, sponsored by the AMARYLLIS SOCIETY OF MOBILE and THE AMERICAN AMARYLLIS SOCIETY, was held March 27 and 28, 1954 in the Murphy High School Cafeteria, South Carlin Street, Mobile.

The Show showed an advance over last year's show. The attendance was much greater, and a delegation from Texas came to the Show. The number of displays was greater than in previous years, and thus the number of competitors was increased. The commercial displays were outstanding—the Amaryllis were centered in sprays of greenery. Mr. Lou Costa won the trophy for the best Amaryllis specimen in the Show, and Mrs. Charles Taylor won first prize for the best arrangement.

An art exhibit was added this year of Amaryllis paintings. This was one of the outstanding high-lights of the Show. Regular art judges made the awards for the best paintings. More and more amateurs are taking up the painting of Amaryllis, and the competition in future years will be even keener. A trophy for the best Amaryllis painting in the Show was added this year.

BRUNSVIGIA DISPLAY AT THE CALIFORNIA STATE FAIR

L. S. Hannibal, *California*

The California State Fair which opened September second, 1954, with its centennial display, went to considerable effort to favor floriculture and outdoor gardening. The main exhibit building, patio area, and floral arrangement building had been considerably enlarged, covering more than three acres. A wide range of summer flowering plants were on display.

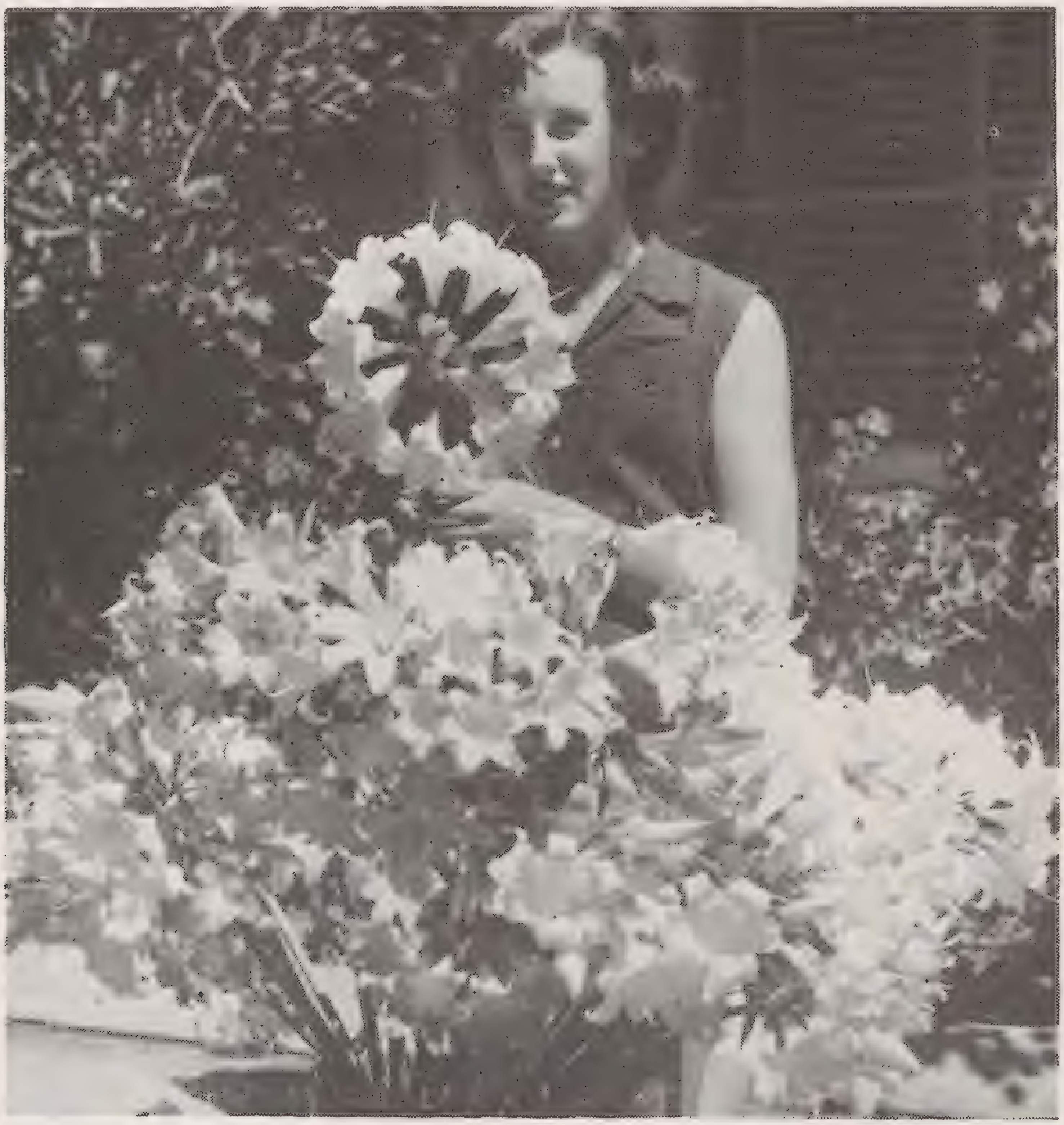


Fig. 3. Miss Carole Hannibal with cut scapes of *Brunsvigia* hybrids at the California State Fair, Sacramento, 1954.

This is probably the first time that Amaryllids were entered on the display list. A wide selection of white and colored *Brunsvigia multiflora* hybrids were furnished as cut flowers and occupied some eight feet of bench space. Replacement cut flowers were taken in every three days and the older umbels were donated to the floral arrangement groups. Several interesting arrangements were worked out using individual blossoms on short pedicels. Examples on display included *B. multiflora rosea, B. multiflora alba,* the well known 'Hathor', the new 'Picotee' series, reds like 'Red Shadow', examples of the orchid type which have been derived from Allister Clarke's 'Glory', and various white and near white seedlings. Several forms of *B. rosea* were also entered such as *rubra,* Frank Leach's 'Grace', and seedlings of wild types collected in Stellenbosch.

Daily attendance at the fair ranged from 75,000 to 125,000 people. It is not known how many attended the horticultural exhibits, but the area was congested heavily most of the time. The Amaryllis display attracted considerable attention. Fortunately a number of reprints from the Bulb Society were available which gave general information on these plants, and a number of copies were passed out to interested people. Should this display become an annual affair, which it undoubtedly will, a simplified information sheet would be most desirable for the public and the staff handling the displays.

As a sequel to the Fair, Albert Wilson featured *Brunsvigia* x *multiflora* 'Hathor' and the newly registered clone 'Peaches and Cream' over the television on the San Francisco station KGO-TV on Sunday, September 19, 1954. In a good natured way he suggested that the writer rather stole the show in Sacramento, but it is self evident that Mr. Wilson has a weakness for these bulbs himself. It was reported that at the Fair he was observed trying to find two similar umbels amongst the seedlings. However, due to the wide variety of material on display there was little opportunity for even near duplications.

Appreciation is expressed for the able assistance and good judgment rendered by Mrs. J. G. Traub, and Mr. and Mrs. Ira Shepard who handled the displays and worked out some very effective arrangements.

VISITS WITH PLANT ENTHUSIASTS

LT. T. M. HOWARD, *Ft. Hood, Texas*

PART I.

Quite often enthusiasts in the field of horticulture are drawn together through mutual interests by the medium of correspondence. In this way it is possible for them to exchange ideas, information, and plant material; however few of them are afforded the opportunity to personally meet and know their fellow garden correspondents. More recently, thanks to improved highways and faster modes of transportation, the factors of time and distance are steadily losing their significance as barriers to traveling. In the past two years I have found it necessary to change my address several times as a result of military commitments made while in College. This moving about has afforded excellent opportunities to visit several plant enthusiasts with whom I had become acquainted through correspondence, as well as other prominent horticulturists. This, coupled with vacationing and my love for traveling, has resulted in the acquisition of new friends, exchanging of information and ideas, as well as satisfying my natural curiosity.

While still in college, in the summer of 1951, I was fortunate enough to meet interesting folks while visiting relatives in the Los Angeles, California area. My first stop, at the Oakhurst Gardens in Arcadia, of Out-of-the-ordinary-bulb fame, came as a pleasant surprise in the form of Mr. James Giridlian, the well known proprietor. Mr. Giridlian was a very cordial, quiet spoken man with a wonderful collection of exotic and rare bulbs and plants growing among scattered gnarled old Oak trees. Although I did not realize it then, this meeting proved to be an eventful one, in that through him, I was able to introduce species of native Texas bulbs to the general bulb growing public. In addition, I was encouraged to write about them for several publications, and thus help to assure their acceptance and establish their popularity.

Later the same day, I stopped at La Verne to visit the famed gardens of Cecil Houdyshel, but he was not at home. My trip was not a total loss though, as his charming wife was in, and she very graciously escorted me about the grounds, pridefully pointing to the rows of hybrid Brunsvigias that were then in bloom. The variety ''Hathor'' with its pure white funnels with ivory throats was particularly impressive. I was amazed at the large field of Crinums and Amaryllis, but was even more surprised to see a row of *Scilla maritima* sending its tall spires of white flowers aloft from the bare earth. I was a bit saddened to learn that they planned to gradually place more emphasis on greenhouse plants and less on field material. This is understandable, when one considers the present labor costs, and the rising popularity from such pot plants as the profitable African Violets. Alas, bulb growers can only sigh and wring their hands.

Back in Texas, I had the opportunity to visit Rev. C. W. Hall in Austin. Although he is a fancier of Crinums and Hemerocallis, he is perhaps best known for his part in popularizing the little fall blooming *Rhodophiala bifida* (syn. *Amaryllis bifida)* erroneously known as *Amaryllis advena,* in both the red and pink forms. Mr. Hall, a Methodist minister teaching Religion at the University of Texas, is a collector of Crinums, and has done much within the State to popularize them as garden subjects. He has attempted crosses between several species, but growing flowering seedlings from this group of plants can be a slow, tedious process.

Through the aid and encouragement of Dr. Victor L. Cory, former field botanist at Southern Methodist University, who encouraged my own interest in native bulbs, I was able to correspond with, and eventually meet Mr. Fred B. Jones, of Corpus Christi. Mr. Jones and myself had parallel interests in native bulbs, particularly the native *Zephyranthes.* By careful observation, Mr. Jones, an excellent amateur botanist, discovered a large flowered yellow *Zephyranthes,* closely akin to *Z. smallii,* growing in the coastal country in the vicinity of Taft, Texas, not far from Corpus Christi. This discovery kindled an enthusiasm for other species and varieties of this group for Mr. Jones, and has led to his collecting and growing bulbs from the coastal plains, the lower Rio Grande Valley, and Mexico. My meeting with Mr. Jones occurred while our Veterinary class was visiting the King Ranch in April of 1953. Our mutual interest in Amaryllids, particularly the "rain Lily" group proved to be a solid common meeting ground for friendship. Through him, another important friendship eventually materialized by way of mutual interests. In Brownsville, another independent enthusiasm for these plants had paralleled our own, in the persons of Mr. and Mrs. Morris Clint. Like Mr. Jones, they were excellent amateur botanists, and green thumbed growers of tropical and subtropical exotics. Their trips into Mexico had unearthed some interesting plant material, some of it for the first time. It was inevitable that our similar interests in Amaryllids should eventually result in our corresponding and exchanging bulbs. Beginning with *Zephyranthes clintiae,* this inspiring couple have collected so many *Zephyranthes* in south Texas and Mexico that many years will pass before the proper identity and placement of their collections can be made by botanists. Although they are technically amateurs, many professional botanists might well be envious of their accomplishments.

[Part II, will be published in 1956 HERBERTIA.]

GARDENING IN THE CLEVELAND PUBLIC SCHOOLS

JOHN F. COOKE, JR., *Ohio*

Horticulture, as a part of the science program, is taught formally in the CLEVELAND PUBLIC SCHOOL SYSTEM in classes from the third grade through high school, and voluntary projects are available to kindergarten-primary teachers. It is a year around program based on short-term projects that are usually finished in one semester, or over one summer. The program was begun at the turn of the century, but was inadequate and purely voluntary until the appointment of Paul R. Young as SCHOOL GARDEN SUPERVISOR in 1926.

At first the program was administered through itinerant teachers, but this was generally unsatisfactory, and the system of short-term projects now in use was evolved. In 1939, Darian H. Smith joined the staff and the program continued to expand. There are six "tract gardens" comprising twenty-one acres, subdivided into individual plots for children's summer gardens. A teacher and a garden superintendent are in charge of each. A greenhouse with seven thousand square feet under glass is maintained at WEST TECHNICAL HIGH SCHOOL, where all aspects of commercial floriculture are taught and where various ornamental plants and some fifty-five thousand vegetables are grown each year for the home gardens. Coordinated with elementary and high school courses are adult night classes in general gardening and flower arrangement. Short courses in various related subjects are made available from time to time.

Those projects of interest to readers of HERBERTIA are the PAPER-WHITE narcissus and fall bulb projects. PAPER-WHITE narcissus are used with three grades in two ways—classroom and voluntary home projects. For the third grade, eight bowls, gravel, and twenty-four bulbs are supplied for each classroom free of charge. Instructions and literature are supplied, as well as lesson plans. For the fourth and fifth grades, a voluntary home growing project is available. For thirty-five cents, each student receives three bulbs, gravel, a bowl, and instructions. A fee is charged because the student seems to have more interest resulting from a tangible investment. It is nominal, and covers actual cost of the materials only in most cases.

The fall bulbs are furnished to upper elementary classes in three ways. First, a unit of four 6-inch azalea pots, ten tulips, six daffodils, and soil is supplied to each class at no charge. The bulbs are planted as a classroom project and then taken to one of four centers for over-wintering. Near WASHINGTON'S BIRTHDAY, they are returned to the classrooms, where the students force them. Second, extra potting units are available at a dollar-fifty each. Three hyacinths, pot, and soil are also available for forty cents. Third, units of bulbs for outdoor planting around the schools are available at cost, with the supervision of one of the horticulturists of the department if desired. The bulbs are all top quality, although older varieties are used because of cost. Double-nose Narcissus, varieties such as 'Rembrandt' and 'King Alfred', top-size tulips, and bedding hyacinths are offered.

Amaryllis are grown and offered to teachers as a special project, but dried-off bulbs are a bit expensive and difficult to start for students. However, with the assistance and supervision of Mr. Wyndham Hayward, we are planning experiments to find an easier method to root dormant bulbs, and perhaps in the future we may be able to offer them to school children.

Our latest major development was started three years ago. At the request of the principal, we will provide supervision and heavy labor for a landscaping development of the school grounds. The children do as much of the planting and fund-raising as possible, and later help with the maintenance. In industrial and crowded areas, we feel that this is especially valuable, because there are frequently no plantings or only the poorest sort nearby. The program is always changing and expanding, and we believe provides much in the way of civic betterment and overall education.

(See also the outline of the School Gardens Program in the Cleveland Public Schools which begins on page 131.)

AMARYLLIS JUDGE'S CERTIFICATES

Up to the time of going to press, the following Amaryllis Judge's Certificates of the American Amaryllis Society have been issued:

1. Mrs. W. D. Morton, Jr., 3114 State Street Drive, New Orleans, La.
1a. Mrs. Douglas Black, 2202 So. Carrollton Ave., New Orleans, La.
2. Mrs. Charles Buckman, 21 Farnham Place, New Orleans, La.
3. Mrs. Marta La Mar, 1203 Marengo St., New Orleans, La.
4. Mrs. Fred Doescher, 6623 Louis XIV St., New Orleans, La.
5. Mrs. Wildray Tudury, 155 Homestead Ave., New Orleans, La.
6. Mrs. J. S. Petty, 1613 Mirabeau Ave., New Orleans, La.

7. Mrs. E. F. Lehmann, 2201 Paris Road, Chalmette, La.
8. Mrs. Charles Arthus, 231 Porteous St., New Orleans, La.
9. Mrs. E. A. Rose, 1509 Socrates St., New Orleans, La.
10. Mrs. Guy Leefe, Jr., 5332 St. Bernard Ave., New Orleans, La.
11. Mrs. A. J. Tomassi, 3915 Elysian Fields Ave., New Orleans, La.
12. Mrs. John Creevy, 3135 State Street Drive, New Orleans 25, La.
13. Mrs. Lilly Ferguson Fisk, 4202 Wildwood Road, Austin, Texas.
13a. Mrs. Virgil Jackson, 524 Betz Place, New Orleans, La.
14. Mrs. Conrad Meyer, Jr., 1732 So. Carrollton Ave., New Orleans, La.
15. Mrs. Claude Pumilla, 5979 Gen. Diaz St., New Orleans, La.
16. Mrs. George Nusloch, 3235 Jefferson Ave., New Orleans 25, La.
17. Mrs. Clyde Griffith, 6014 Vicksburg St., New Orleans, La.

EXAMINATIONS FOR AMARYLLIS JUDGE'S CERTIFICATE. For information about taking the examination for the AMARYLLIS JUDGE'S CERTIFICATE of the AMERICAN AMARYLLIS SOCIETY, please write to Mrs. W. D. Morton, Jr., 3114 State Street Drive, New Orleans 25, La. Judges are requested to attend a local refresher short course each year, if possible, in order to keep up with progress in this group.

2. SPECIOLOGY

[EVOLUTION, DESCRIPTION, CLASSIFICATION AND PHYLOGENY]

RE-DISCOVERY OF **ZEPHYRANTHES CONCOLOR**

MRS. MORRIS CLINT, *Texas*

On May 12, 1954, Fred B. Jones of Corpus Christi, Texas, my husband Morris and I set out for Mexico on a trip which was to prove a momentous one. The trip was one of those affairs which seem to mushroom out of nothing—a short vacation to the city of San Luis Potosi planned by Morris and myself; Fred's offer to supply us with data on known collection locations of *Zephyranthes* species native to the immediate area; a chance exclamation of recognition by our farm hand, José, who is from the neighboring state of Aguascalientes, Mexico, upon seeing early blossoms of *Z. grandiflora* in our garden. Fred had done considerable research on *Zephyranthes*, particularly those species known to be native to Mexico. His promised letter, listing *Z. concolor*, *Z. verecunda* and *Z. lindleyana* and giving the locations in the state of San Luis Potosí where these species had formerly been collected by the botanists, Pringle, Schaffner, Parry and Palmer, arrived a few days before José noticed *Z. grandiflora* and made his now famous remark, ''We have flowers like those in Aguascalientes except that their color is yellow.'' Thinking that perhaps he meant *Z. longifolia*, we asked, ''Small ones, José?'' You can imagine our excitement when he answered, ''No, we have those, too, but there are large yellow flowers, about the size of these,'' indicating *Z. grandiflora*. We were immediately and elatedly certain that José's ''large yellow flowers'' could be none other than *Z. concolor*, a species which has long been lost to cultivation. Thoughts of a staid vacation were promptly forgotten and excited plans for the quest of *Z. concolor* were soon under way. Fred needed little urging to accompany us and there began a frenzied period of preparation—letters flew back and forth from Brownsville to Corpus Christi; maps of all kinds were checked and re-checked; routes and counter-routes were plotted and timed; José was quizzed and questioned at great length. Our enthusiasm received quite a jolt when we discovered that only two of Fred's locations, Bocas and Charcas, could be found on a road map and learned that the road to these towns was little more than a trail, for we remembered that most of the early botanists had travelled by railroad and many of their collection points are still inaccessible to the average motorist. However, we were not discouraged very long, for our endless questioning of José led us to believe that the range of *Z. concolor* was more extensive than botanical literature has revealed, as he assured us that the bulbs were to be found scattered over the entire state of Aguascalientes and that he had seen them along the roadside in the state of Zacatecas as well. We selected the middle of May for our departure since José's statement that the bulbs bloomed in the month of May, after heavy fainfall, seemed to be confirmed by the dates of collection in the data furnished to us by Fred.

The three of us made a companionable trio, for Fred is a confirmed amateur naturalist and proved to be as fascinated by the biology and topography of Mexico as we have always been. Morris took the wheel and was to cover the area ahead, I had the right front and Fred the left rear observation post. As it was Fred's first trip to San Luis Potosí by automobile, we had allowed time for frequent stops so that we could all wander about at intervals and enjoy the scenery and the plants at close range. An extra day was allotted to the mountainous road between Antiguo Morelos, Tamaulpas, and Cuidad del Maiz, in the state of San Luis Potosí, for this 50 miles or so of Highway 80 is one of the most beautiful drives in Mexico and sustains a fabulous assortment of plant life. Here, as is usual in seasonal rain forests, one is surprised to find plants normally associated with desert conditions happily established with those known to be moisture loving—*Hechtia,* cacti and *Agave* growing side by side with ferns, bromeliads and orchids. Each change

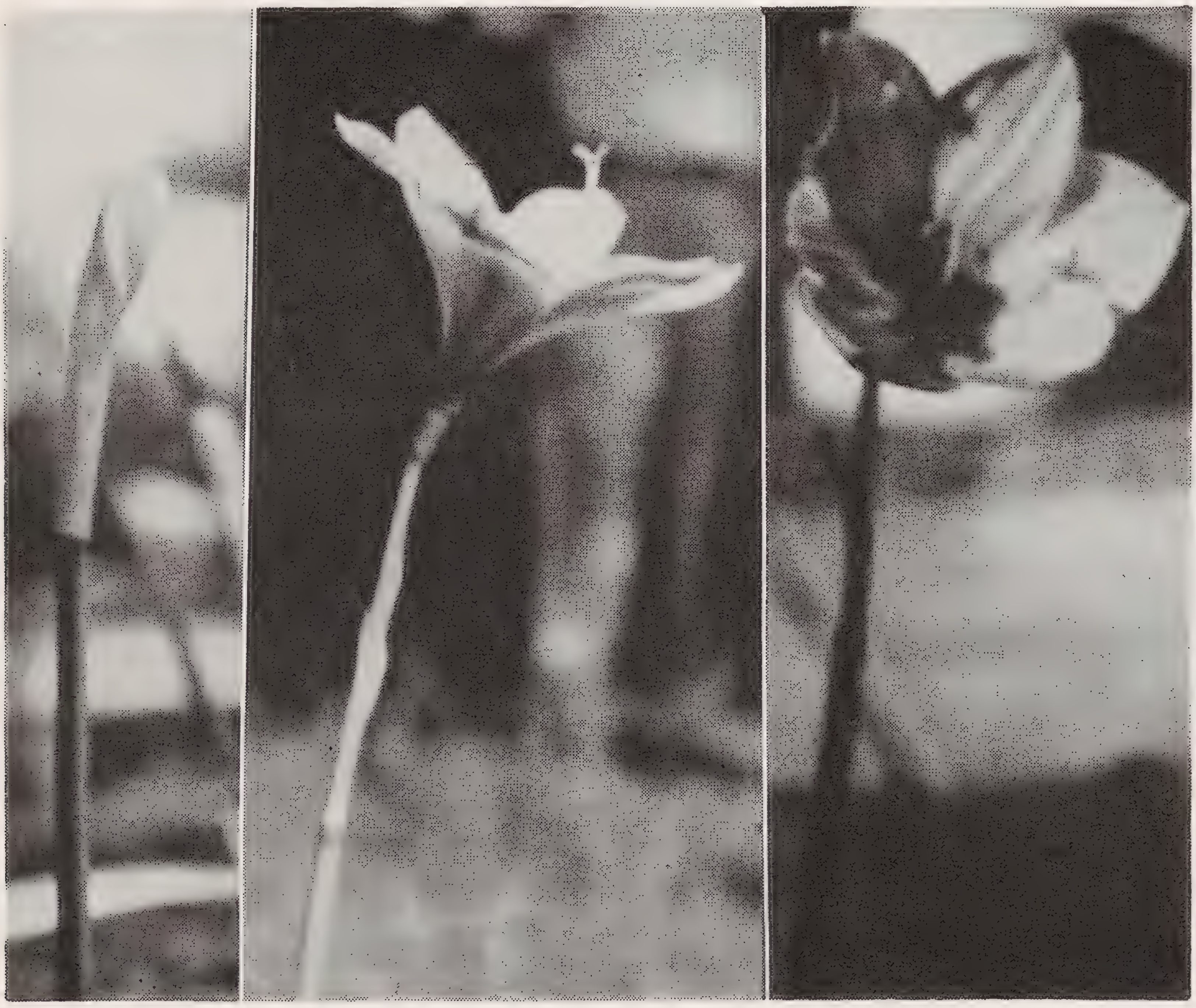


Fig. 4. Flowering habit of *Zephyranthes concolor:* (left), June 27, in bud, evening before opening; (center), June 28, 8 a. m., showing almost flat face, flower almost erect; (right), June 28, 5 p. m., showing change in form and position of flower. Photo by Mrs. Morris Clint.

in elevation brings something new of interest and the time always passes quickly, as one sees many old acquaintances established in their native habitat and encounters an ever-changing array of strange new lovelies.

From 1500′ to 1800′ elevation, *Beaucarnea* is found in vast numbers. These mammoth-trunked trees, clothed at the tips of their branches with rosettes of narrow, ribbon-like, gracefully recurving leaves, are seldom without some sort of floral display and now carried great panicles of vari-colored seed pods—from cream or greenish white through various shades of pink and rose to a deep rust-red. Apparently the color varies with the amount and intensity of sunlight that the panicles receive, for we know that the seeds do not ripen until sometime in early winter.

A little farther on, we stopped at a place that Morris and I have privately named ''Chamal Ranch,'' for a species of *Dioon,* known to the natives as ''Chamal,'' is to be found here in great abundance. The lower fence of the ranch is some distance up the mountainside and the road travels through a broad, rocky shelf at this point, so that we were able to walk about and enjoy these lovely cycads. Recent rains have brought forth new crowns of downy leaves, some purplish and some silvery-grey—still soft and pliable, yet giving some hint of their ultimate fern or palmlike beauty. One finds, also, numbers of pretty, dwarf fan palms with very slender trunks. Fred noted that many of the larger specimens are decumbent and we presumed that the trunks are not strong enough to support the heavy crown of leaves and the numerous, much-branched inflorescences. We had seen these two plants together in great numbers on a bare, sunny hillside at a much lower elevation and now decided that the hill had been man-cleared, for the species are so much more beautiful here and seem so much more at home in this heavily shaded area.

Another few miles brings two other cycads—a dwarf *Zamia* with dark green, papery leaflets which are narrow and slightly toothed on the edges; a species of *Ceratozamia* with long, recurving, pinnate leaves which carry many broad, leathery, dark green leaflets. At this time of year, the bronzy color of the new leaves on the latter makes them easy to spot against the green background of the heavy vegetation. Fred was so intrigued with these lovely plants that he narrowly missed a bad tumble when a rock slipped as he was climbing the steep embankment to get a closer view.

At last we approached the area where one might expect to see *Zephyranthes* in some quantity and we drove slowly and hopefully watched for blooms. A careful search on several stops revealed many bulbs in foliage and quite a few scapes in seed, but not a single blossom. Rainfall through the mountains thus far had been plentiful, if one could judge by the lush green of the vegetation—in fact, we were rushed on our way by a sudden downpour, and wondered if this shower would bloom some of the bulbs in time for our return trip. We were now about 4200′ in elevation and almost at the edge of the rain forest. Within the next few miles, as one climbs still higher, the vegetation thins noticeably and the country becomes appreciably more arid as one approaches the western side of the mountain range.

As we came to the more open territory a few miles from the valley of Puerto de Lobos, our rain left us abruptly. We were acutely disappointed to find Puerto de Lobos dust-dry and brown, and the season almost a month late. We looked with regret at the parched cliffs and slopes bordering the valley, for we have seen these solid pink with *Zephyranthes* blossoms. We poked around in the dried grasses and weeds at the base of the rocks but found no signs of the bulbs, so reluctantly and without stopping, we drove by Canyon de Borregos, where we had hoped to see *Z. clintiae* in bloom. We found it hard to believe that such a few miles could make such a big difference in the time and quantity of rainfall.

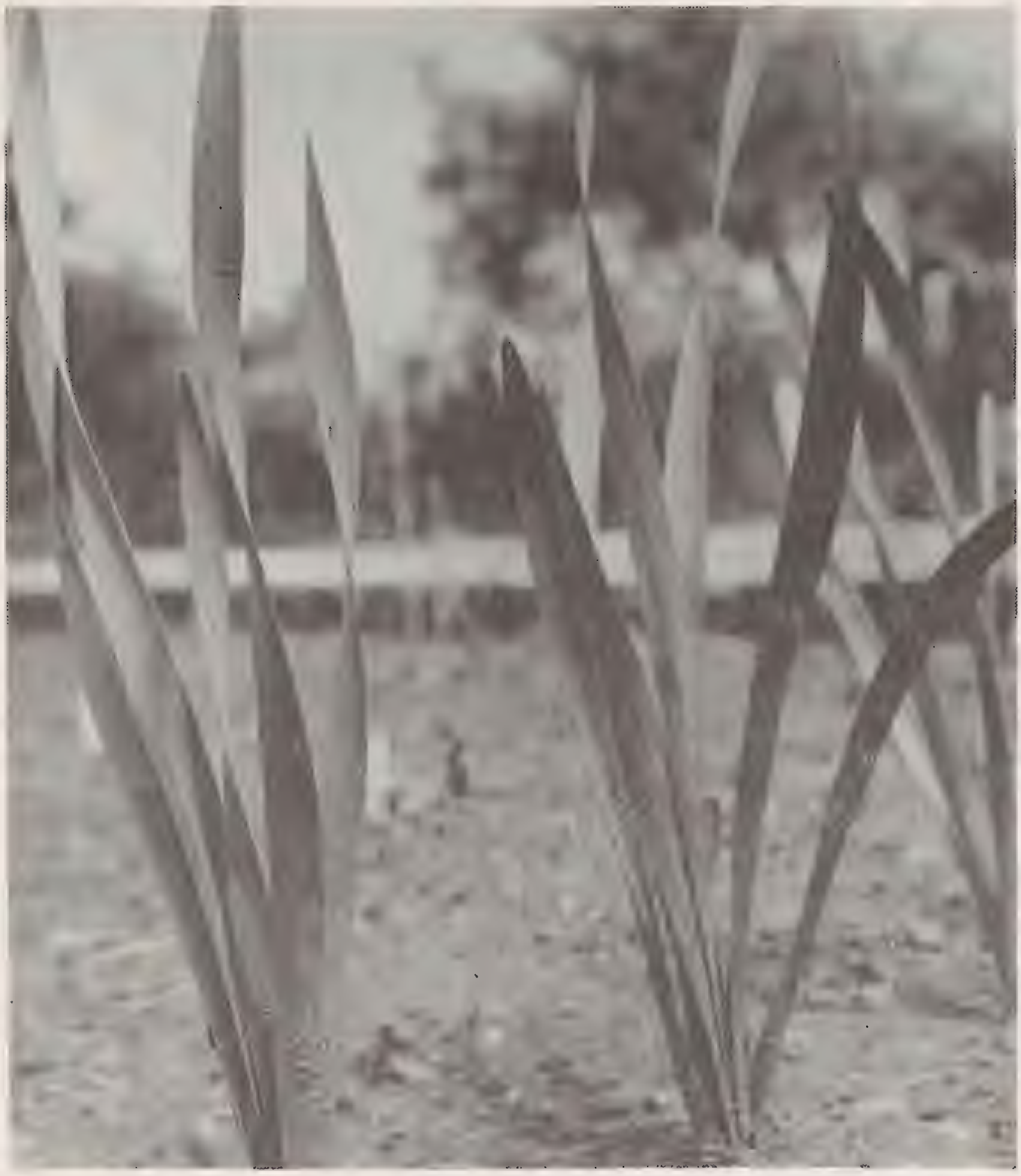


Fig. 5. Leaves of *Zephyranthes concolor,* 14 inches long, ⅜ to slightly over ½ inches wide. Photo by Mrs. Morris Clint.

Beyond Cuidad del Maíz, we drove through the last of the mountains that we were to see for some time, rocky and barren except for desert species of *Agave, Dasylirion, Yucca, Hechtia* and cacti. We have been told by one of the professional collectors that these particular hills are some of the richest in fine cacti species in all Mexico. We were delighted with the highly colored forms of *Agave stricta*—rose, purple and deep red—which cover the steep hillsides, and were charmed with the bright yellow clumps of *Hunnemannia fumariaefolia,* the Mexican Tulip-Poppy, which seem to grow and thrive on thin air. We noticed a species of Ocotillo which seemed different from those to be found in West Texas, for the flowers were dull orange instead of red, but the plants were not too abundant and we were never able to stop when we caught sight of a group of them within easy walking distance.

On the desert plateau, there was little evidence of spring rains and we began to wonder if we were to find the area around the city of San Luis Potosi dry, also, and our trip fruitless. However, about 75 miles from the city our spirits soared, for we began to see signs of fairly recent shower activity, with standing water in the ditches and low places. This desert wasteland seemed a strange place for *Zephyranthes* but we made frequent stops to search for them, for we have long since learned that these little bulbs are quite often found in the most unlikely places. At last, and quite by accident, we were rewarded! As Fred bent down to examine a small cactus plant at the base of one of the low desert shrubs, he was amazed to see a tiny yellow rain lily. The flower appeared to be closing, but was very plainly *Z. longifolia.* We discovered many of the bulbs in bloom, their segments barely cracked open, and an even greater number of scapes with mature or open seed capsules. We were to find this species in quantity at every place we stopped while on the plateau and saw many bulbs in bloom, if one could call it that, but we never saw an open flower. We knew this to be a failing of the species, but have had fairly open flowers in our garden, so couldn't help but wonder why the blossoms should not be of better quality here in their native habitat. Since this time, bulbs of *Z. longifolia* from West Texas have bloomed in our garden under varied moisture conditions and we found that only under a plentiful supply of soil moisture at the actual blooming date of the blossoms do they give a successful performance.

We spent quite a little time at this spot, for we were thrilled at finding the first *Zephyranthes* blossom of the trip and pleased to have ourselves seen *Z. longifolia* in central Mexico (Schaffner found it in S. L. P. in 1877). The site was not without beauty for there were numerous specimens of *Yucca australis,* many of which were in full bloom—the lovely, cream white flowers hanging in long, pendent panicles. After taking a few color photos we all searched very carefully for some signs of *Z. concolor,* but without success. Very reluctantly, we finally drove on, for time was creeping up on us.

We continued to pass through intermittent shower areas, but several short exploratory stops revealed nothing but the ubiquitous *Z. longifolia* until about 45 miles from San Luis Potosi, when Fred and I called out almost together. We had both seen the unmistakable flowers of *Zephyranthes* but, strangely enough, Fred had seen white ones and I was sure that they were pink. As we piled out of the car, we found that we were both right and later discovered an intermediate form, a smaller blossom of light pink. It was very late in the day and the flowers were closing rapidly, but we attempted color photos anyway. By the time we had finished with the group of light and dark pink flowers, we found to our dismay that all of the white variety were completely closed. As there were still many buds, we resolved to return the next day—but events decided otherwise.

This locality was a little different from the territory we had been passing through—slightly higher and very rocky, with heavy outcroppings of caliche. Altitude was 5800′. We were to discover that the pink, red and white *Zephyranthes* seemed to choose these rocky soil formations. Needless to say, we wandered about for some time, allowing ourselves just enough time to reach the city before dark. *Z. longifolia* was present in abundance and Morris found one clump of what appeared to be *Z. brazosensis* with several freshly opened flowers, but none of us saw anything which could possibly be *Z. concolor*. Morris questioned a young rancher who chanced by on a burro. The young man seemed pleased at our interest in the flowers and remarked that we were the first people that he had ever seen stop to admire them. He said they were called "Mayitos" as they usually bloomed with the first rains of May and that we were very lucky to have found them in bloom for there had been so little rainfall. When asked if there were large yellow flowers anywhere near he replied that he thought so, but that they bloomed in June, after

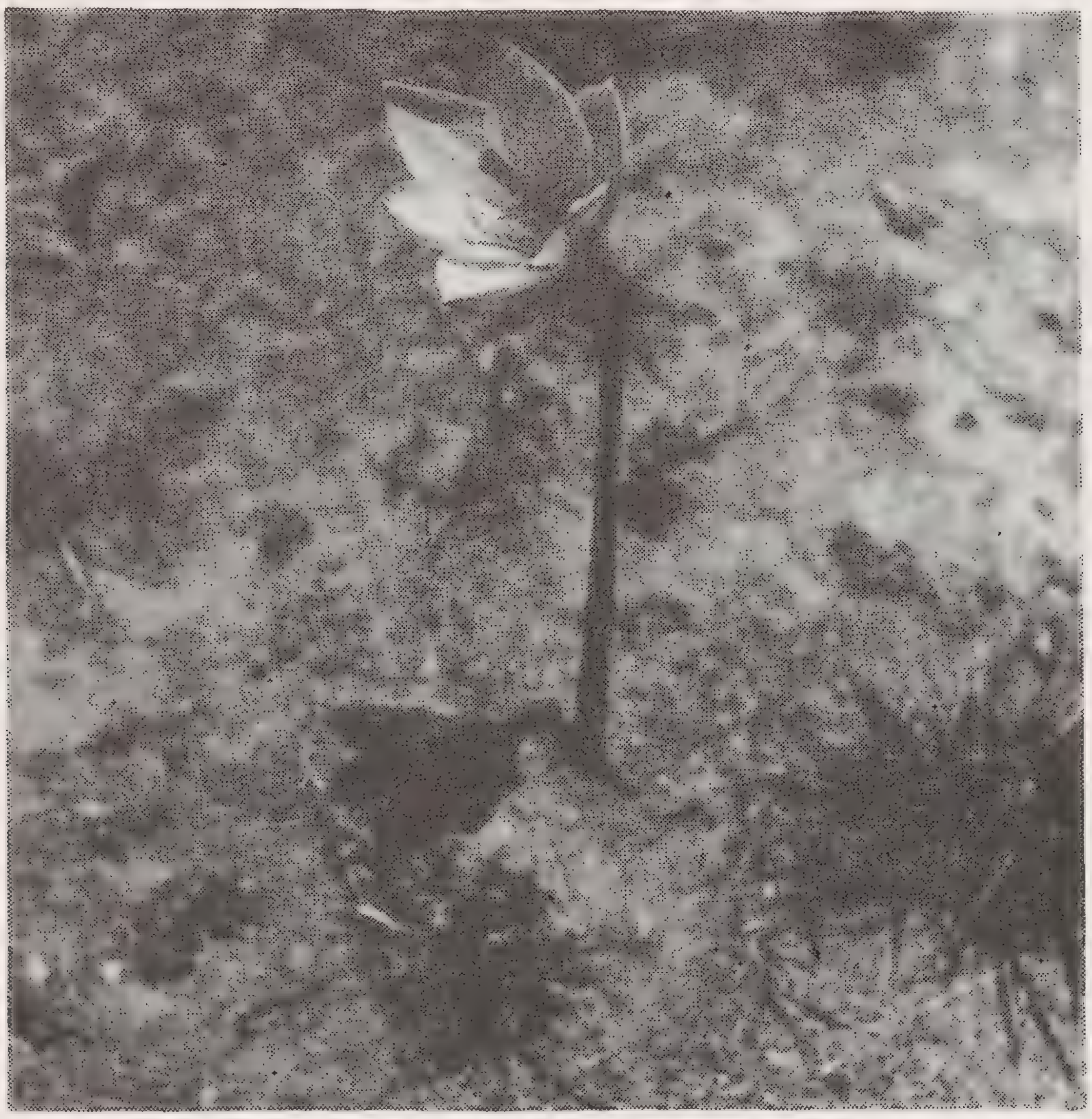


Fig. 6. *Zephyranthes concolor;* 18½ mi. S. W. of San Luis Potosi; about 1/3 nat. size; growing among grassy-like plants and various irids, etc. in red soil. Photo by Mrs. Morris Clint.

heavier rains. Shortly afterwards, Morris and I stopped an old woman who was on her way to a nearby village with a large basket balanced on her head. She was a pleasant soul, very interested in the flowers and well informed about their habits. She said that all of these now in bloom—the white, the pink, the rose, the small yellow *(Z. longifolia)*—were called ''Mayitos,'' but that there were also large yellow and large, pure white flowers which bloomed in June, with the much heavier rainfall. These she called ''Mañanicas'' (''Mañanitas'' is also used). The word was such a tongue twister that we did not at first realize that it was derived from the word ''Mañana'' and means ''daybreak'' or ''very early in the morning.'' I rather think that the derivation in this instance stems from the other meaning of the word, ''tomorrow'', and is colloquially used to distinguish the later blooming bulbs from the ''mayitos'', but we have yet to find anyone to corroborate this. When asked where these ''Mañanicas'' were to be found, she was a little vague as to exact locations but said that they were in groups ''here and there'' all along the highway in that vicinity. The old woman seemed very partial to the white flowers, referring often to their size and their white purity—but these still remain a mystery, perhaps to be solved at a later date. These two conversations were highly interesting and most exciting, but also very disturbing. It now seemed certain that we were on the trail of *Z. concolor,* but were we to be a month too early to see the bulbs in bloom?

The next morning, we inquired at the courts in San Luis Potosí about some of our collection points, mostly with negative results. It seems that Morales is now within the city (just around the corner from our courts) and is at present the site of a large smelter. About Las Canoas we received vague and conflicting reports, but gathered that there was no road to this little community. We were told again that the road to Charcas and Bocas was very poor, almost impassable. However, we set out to find it, thinking that we would at least see for ourselves how bad it was and perhaps try it out for a short distance. As it happened, we were given erroneous directions at the filling station and failed completely to find the cut-off leading to Bocas and Charcas, so we decided to drive out on Highway 80 as far as the spot where we had seen the ''Mayitos'' the evening before.

We had driven only 14 miles when I saw a large group of plants along the roadside that I was particularly anxious to photograph, a tufted liliaceous species which blooms in less than a year from seed and makes an attractive, drouth-resistant garden subject. While I was busy with my camera and Morris was gathering seed, Fred walked across the road toward a group of small trees, saying that he had a hunch that we were going to find our bulbs in partial shade. Soon, he called very nonchalantly (considering how wildly excited he must have been) that he had something to show us that we might find interesting. The ''something'' was unquestionably *Z. concolor!* We were thrilled beyond words and had to pinch ourselves back to reality, for it all seemed like a dream. The bulbs had bloomed heavily some two or three weeks earlier for there were many seed capsules well on their way to maturity. Leaf growth was well advanced and it was soon apparent to us that the bulbs were present in great abundance in the immediate area, growing both in shade and full sunlight. The altitude was 7800′ and our location was a narrow moisture strip which crossed the road at a slight angle. The soil was a light sandy loam and supported a good growth of Mesquite and Huisache trees as well as a tangle of Prickly Pear, Cholla and other cacti, *Agave* and small desert shrubs of many kinds. The inevitable *Z. longifolia* was also present in quantity.

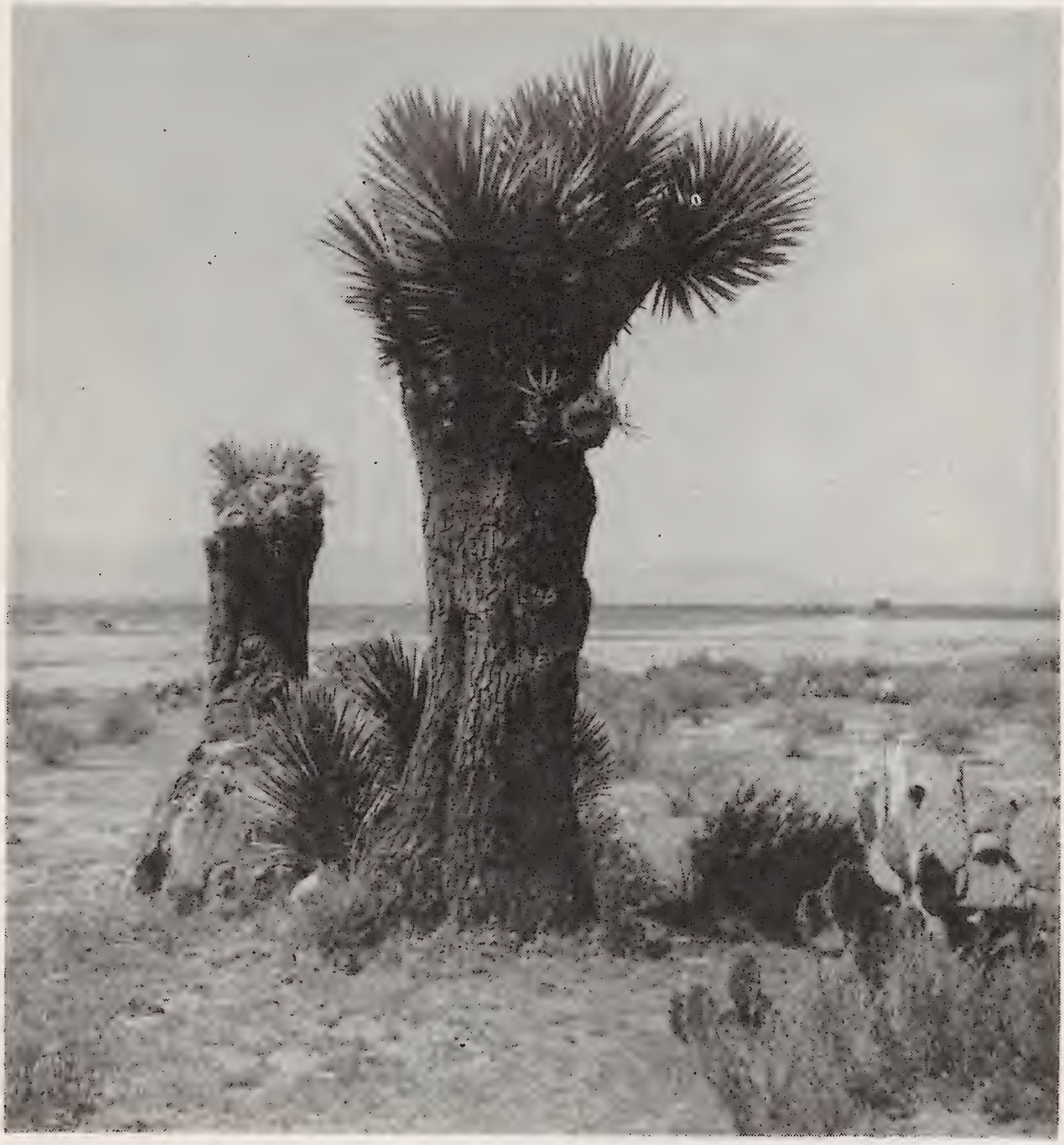


Fig. 7. Habitat of *Zephyranthes concolor,* 18½ mi. S. W. of San Luis Potosi; not many of these large Yuccas are left—the natives have used them for firewood. Photo by Mrs. Morris Clint (5-15-54).

We searched in vain for an open flower of *Z. concolor,* but had to be content with a few dried remains that we found still clinging to the capsules. Upon examining these, our identification seemed complete, for they showed clearly a very short tube, very long style and stamens of two markedly different lengths. The stiffly erect, broad (½ to ¾ inch), glaucous leaves, the 3-3½ inch pedicels and the extra large seed capsules completed the picture. Rejoicing over our discovery knew no bounds, but it also served to spur us on, for now we felt that we simply must see the bulbs in bloom. We reconnoitered a bit in the immediate neighborhood but found nothing more of interest. By then, it was well along toward noon and we decided to return to the city and drive south on Highway 80, then east on Highway 45, toward Leon, in the state of Guanajuato. It was a very happy and fortunate decision.

Very shortly after coming onto the plateau again (one drives through very rugged mountains for a short distance south of San Luis Potosí), I noticed my liliaceous plants in heavy drifts along the roadside. I commented on the luck they had brought us earlier in the morning and the words had barely died on my lips when I was startled to see—some distance away on the prairie—a huge, light yellow *Zephyranthes.* We had been driving rather fast, so that by the time Morris could stop the car, the flower was out of sight. There were many joking remarks and I was accused of "seeing things." Morris turned the car around, rather dubiously but graciously enough—but Fred and I were already out and running toward the spot where I had seen the flower. We soon sighted it again on the bare ground and, even at a distance, were certain that this was at last *Z. concolor.* [Figs. 4, 5 & 6] We turned excitedly toward the road, waving our arms wildly for Morris to hurry, only to find him bouncing toward us over the prairie in the car. We all stood in awe for some time before the lone blossom, so startlingly beautiful in such incongruous surroundings. [Fig. 6] It was far more lovely than we had imagined, but we realized that no cold botanical description could ever do justice to this flower. Mixed thoughts raced through our minds—elation, gratitude, pure dumbfounded amazement at our good fortune. How had it been possible for me to see this solitary blossom, 100 yards or more away, from a fast moving automobile? True, it was quite large—2½ inches or more across the open face and slightly more in length—and very full, with broad segments almost an inch across. The bulb had bloomed on little rainfall, for the reddish, sandy loam was very dry, and had sent up only the bare scape, a scant 8 inches high. The flower was a light, rich yellow with a hint of green in the color complex and was set at an angle on the stem similar to *Habranthus.* The perigone was not constricted above the short, almost non-existent tube, but flared outward somewhat abruptly, giving the flower a very unusual appearance for a *Zephyranthes.* If one could forget a little botany, here was a dainty, miniature *Amaryllis.*

The cameras worked overtime, as Fred and I photographed the flower from every conceivable angle, for we realized that we might never have this opportunity again. Morris, meanwhile, wandered around and found all kinds of interesting small flora, setting their first leaves or buds of the season—*Iris, Milla, Tradescantia, Oxalis* and *Allium.* Our altimeter read 7800′ and the speedometer told us that we were only 18½ miles south of the city of San Luis Potosí. The plateau here was rather barren in a pleasing way, with a few sparcely scattered desert shrubs, small cacti and an occasional tree *Yucca,* apparently *Y. australis* but not yet in bloom. Some distance away, on the edge of a slight drop in terrain, was a heavy stand of a fine, mammoth-padded *Opuntia* species. Right in the middle of one of these cactus clumps, Fred discovered a pale pink *Zephyranthes.* [See Fig. 9] After this, we were prepared for anything! A few more flowers of the pink species were found in and around the groups of Prickly Pear and a few more in leaf only were seen in open ground, so we reasoned that the species was here in some abundance.

As we finally turned south once more, all were very much on the alert for *Zephyranthes* blooms. Rain had come in a series of widely scattered showers, but there was little to guide us except the open blossoms, for the thirsty earth had quickly absorbed all moisture. Twice we stopped for false alarms, once for a yellow prickly Poppy and another time for a whole field of dark rose blossoms which proved to be the flowers of a species of Devil's Head cactus. It was Morris who finally saw the heavy stand of light pink *Zephyranthes* near the roadside, about 35 miles south of the city. [Fig. 9.] This spot was different in character from our *Z. concolor* location, being one of the small ''rises''—not quite a ridge nor a hill—which are frequent on the plateau. Altitude was 8000′. The soil was a rocky, sandy loam and was well covered with the usual desert bushes, tree Yucca, immense specimens of Prickly Pear and clumps of *Cholla.* The *Zephyranthes* bulbs seemed to be partial to the *Cholla* and were blooming in some numbers at the base of these plants. We had noted the tendency of the bulbs in many locations to choose a similar home and thought at first that they were seeking some shade, but a likelier explanation seems to be that the collection of debris and leafmold always found around the plants or cactus gives them added moisture and food—also the plants themselves afford the bulbs some measure of protection from stray animals and the heavy washing of flooding rains.

Just a mile or so farther, we came upon more *Zephyranthes*—the locality an almost exact duplicate of our last stop, having the same rocky soil with perhaps more *Yucca* and Prickly Pear and less *Cholla.* We again found the light pink flowers and saw also a few blooms of another form, a dark rose or light red. We noted that these particular flowers had an extremely short pedicel, shorter than the light pink flowers and much shorter than those seen on the upper plateau, and laughingly wondered if we were not following the evolutionary path toward *Z. fosteri,* which was collected by Mulford Foster in the state of Jalisco, not too much farther south than our present whereabouts. This speculation still remains open, for we were soon to drive out of the shower areas.

Several solitary blossoms of *Z. concolor* were observed in the shallow bar pits along the roadside as we drove along. These occurred at infrequent intervals, the last one seen being just a few miles north of Ojuelos de Jalisco. We had meantime entered a heavily farmed portion of the plateau and had come to the southern limits of the rain showers, or would have perhaps seen more blossoms. The extreme dryness of the country beyond Ojuelos and the endless monotony of the empty plowed fields became depressing, so we turned back without penetrating very far into the state of Jalisco.

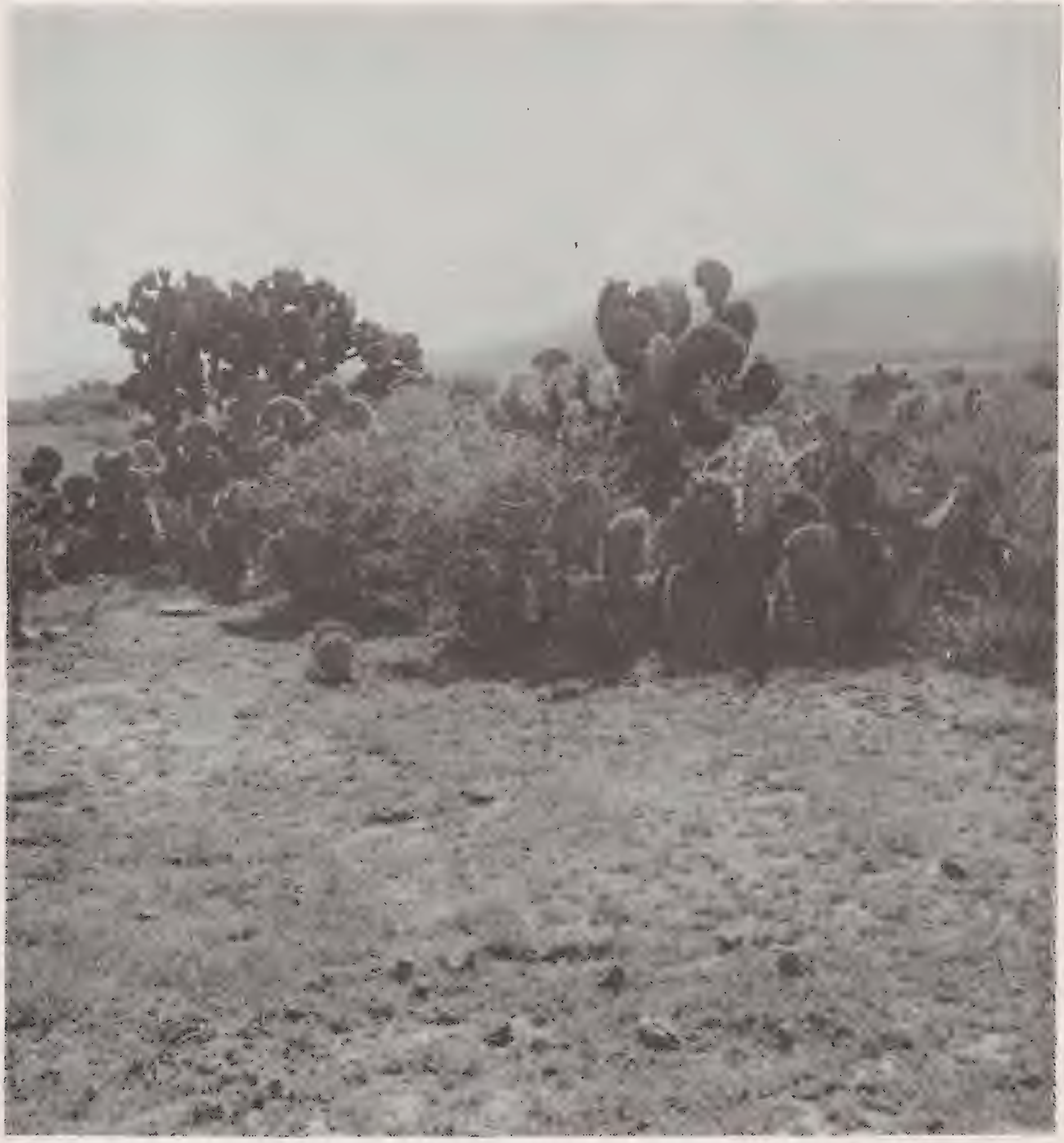


Fig. 8. Habitat of *Zephyranthes concolor,* 18½ mi. S. W. of San Luis Potosi, showing cacti, etc. Photo by Mrs. Morris Clint (5-15-54).

The next morning we started out full of hope and expectation, for we planned to drive through the state of Aguascalientes and as far north into the state of Zacatecas as time would permit. We reasoned that perhaps the rains had travelled westward, since they had not extended very far to the south. As we drove through the short strip of mountains just south of San Luis Potosi, we again admired the numerous specimens of a blue-grey species of *Dasylirion* which Morris and I have coveted ever since we first saw the plants two years ago. The plants were sending up tall bloom spikes and we wished there were time to look for seed left from the year before. Numerous *Hechtia* were seen in heavy patches on the rocky mountainsides and we wondered if these were the same species seen on the upper plateau, or whether they were still another species. As we passed through the foothills, Fred wondered (not for the first time) if there were not *Zephyranthes* on the hillsides and rather wistfully remarked that he would dearly love to see them blooming in the mountains. As if to grant his wish, we suddenly saw their bright blossoms on the lower edges of the rocky hills. There was no safe place to stop, but we fortunately found another colony just beyond, on more level but very rocky soil. As usual, the "Mayitos" were in the greatest numbers at the base of available plants—shrubs, cacti and clumps of a large and particularly vicious Agave. There seemed to be a bewildering assortment of forms and colors, including the light and dark pink we had seen the day before. One outstandingly beautiful flower was a large deep

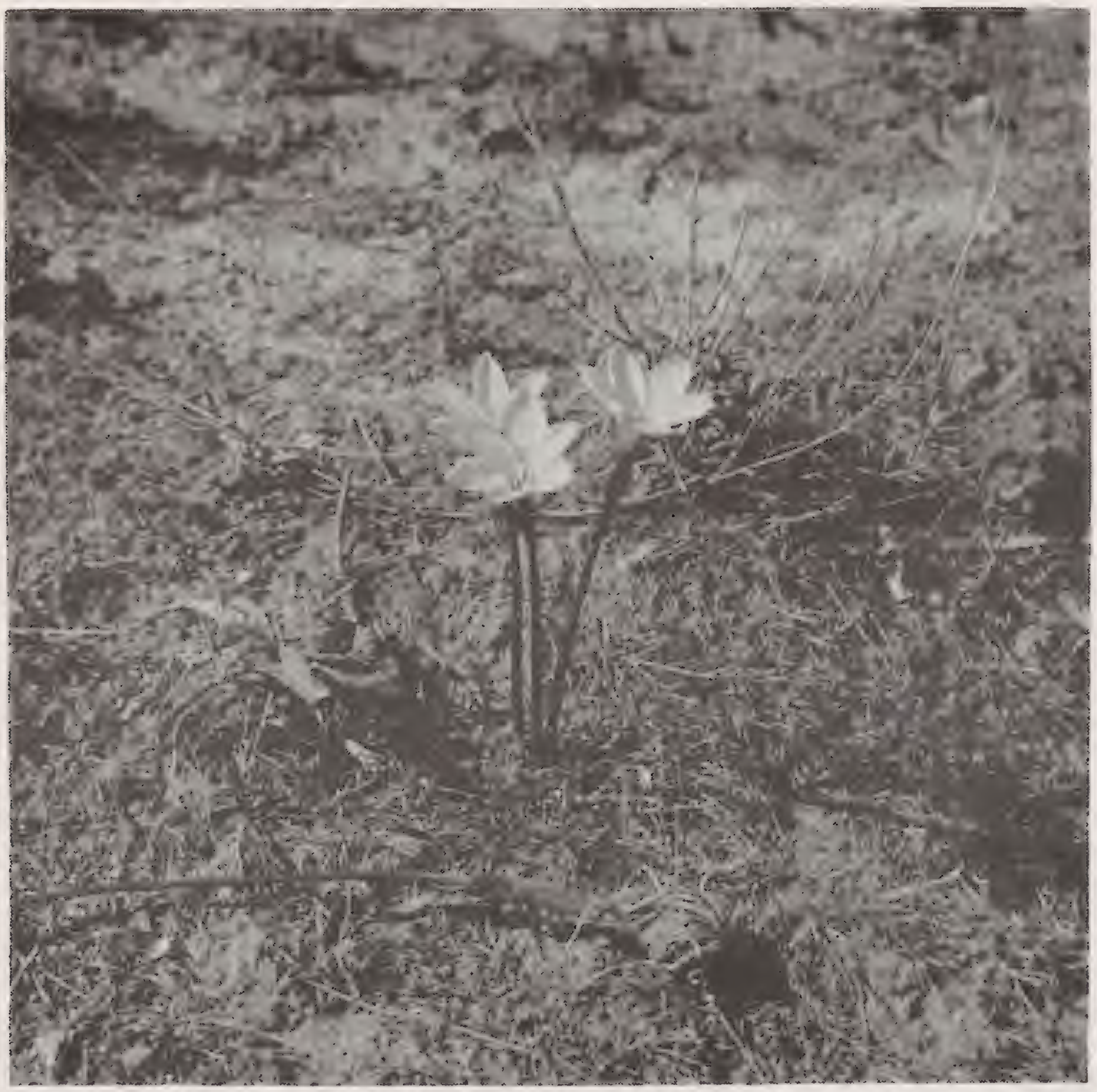


Fig. 9. Light pink *Zephyranthes* species; about 35 mi. S. W. of San Luis Potosi; Clint #M-426; scape about 8 inches tall. Photo by Mrs. Morris Clint (5-15-54).

rose with a white throat, a little similar to *Z. grandiflora* but differing chiefly in the shorter, more upright style. For a moment I thought that a deep red flower was identical with bulbs we had collected years ago, east of Cuidad del Maíz, but found that it had a much shorter tube and pedicel, and leaves of an entirely different character. To make things more interesting, we discovered that we were not far from Canoas, one of the very locations we had been searching for. *Z. pallida,* said to be close to *Z. lindleyana,* was collected by Pringle near Las Canoas in 1891.

As we drove south over the same territory we had covered the day before, we kept a sharp watch for stray blooms of *Z. concolor,* for Fred wanted a specimen for pressing. He had taken one of the large rose blossoms on the preceding stop and was later to press a couple of the white flowers found in the caliche outcropping north of San Luis Potosí. With no equipment but a few sheets of newspaper, our ice box for a weight, and the rising heat from the floor of the car, his dried specimens were remarkably beautiful and would have been the envy of any field botanist. History repeated itself and I again spied a lone flower some distance away on the bare prairie, but this time there were no joking comments. As we stopped, we realized that we were only a fraction of a mile beyond our discovery point of the day before. We eventually found six or eight flowers in the immediate vicinity, very widely scattered and often almost hidden from view by small shrubs. One large bulb carried two scapes with freshly opened flowers. Fred took two blossoms for pressing, choosing a large and a small one.

Shortly after turning west at Ojuelos into Highway 45, we saw signs of recent rainfall, so were not surprised to fine *Z. concolor* in bloom on a gravelly hillside. There were more open blossoms than we had seen at any one time or place. Several bulbs carried two scapes, but all of the flowers were inferior. The blossoms were a lighter, more creamy yellow, with somewhat undulate segments. At first, we thought that perhaps we had found a variation, but finally decided that the flowers were a day or so old, which explained the paler color, and that the slight distortion was due to lack of moisture. It was our first glimpse of the species on other than level land and in gravelly soil, and it also definitely placed the bulbs in the state of Aguascalientes. The elevation was 8000′.

This was destined to be our last stroke of luck for the day, for the showers had not extended westward, as we had hoped, and the country was pitifully dry. We drove north from the city of Aguascalientes well into the state of Zacatecas, but found a repetition of the same dry, heavily farmed land which had caused us to turn back the day before. We were sorry not to see the bulbs in bloom near José's home town of Rincon de Romos, for we knew he would be disappointed. We looked at the hills in the distance and thought that one would find them there in abundance a little later in the season.

It still remains a mystery to us why *Z. concolor* has been so long lost to cultivation. Why has not someone seen or collected this species since the opening of paved highways through the central plateau region of Mexico? It now appears certain that the range of the species is very extensive, covering portions of the states of San Luis Potosí, Aguascalientes, Zacatecas and Guanajuato, and perhaps extending into Jalisco, Querétaro and other states of the great central table land. It is true that the bulbs occur in abundance only in isolated colonies in many places, due to extensive farming operations, but it seems equally true that they are still to be found in small numbers along the roadsides in these same farming areas. If we had been just a week or so later, perhaps we could give a clearer picture of their full extent and abundance. In July of this same year, Morris and I located a large colony of *Z. concolor* in full and luxuriant growth in the state of Guanajuato, less than a mile west of the state line of Querétaro. We were surprised to find the soil a mellow clay loam, which would seem to indicate that the species is not too particular as to soil.

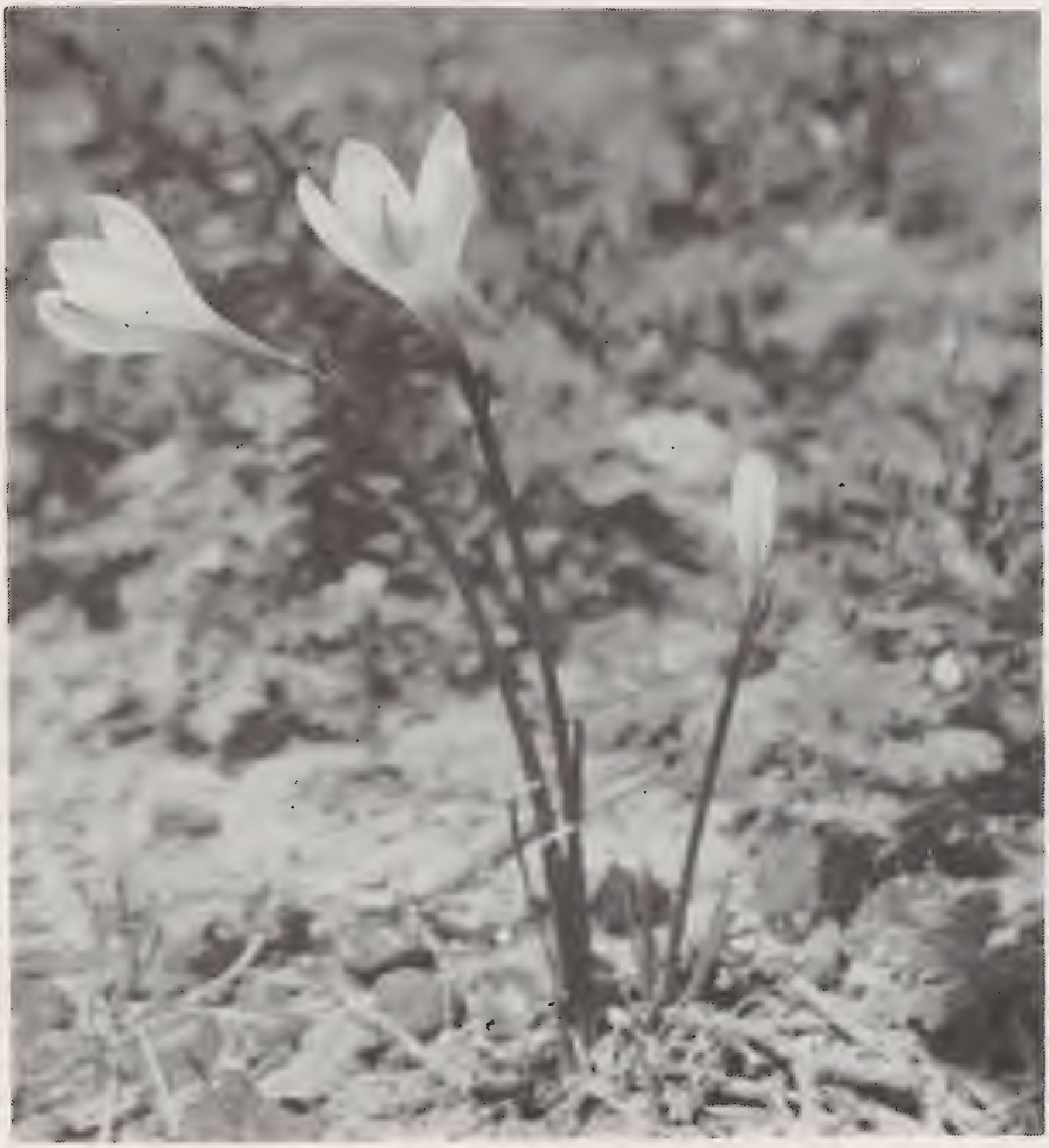
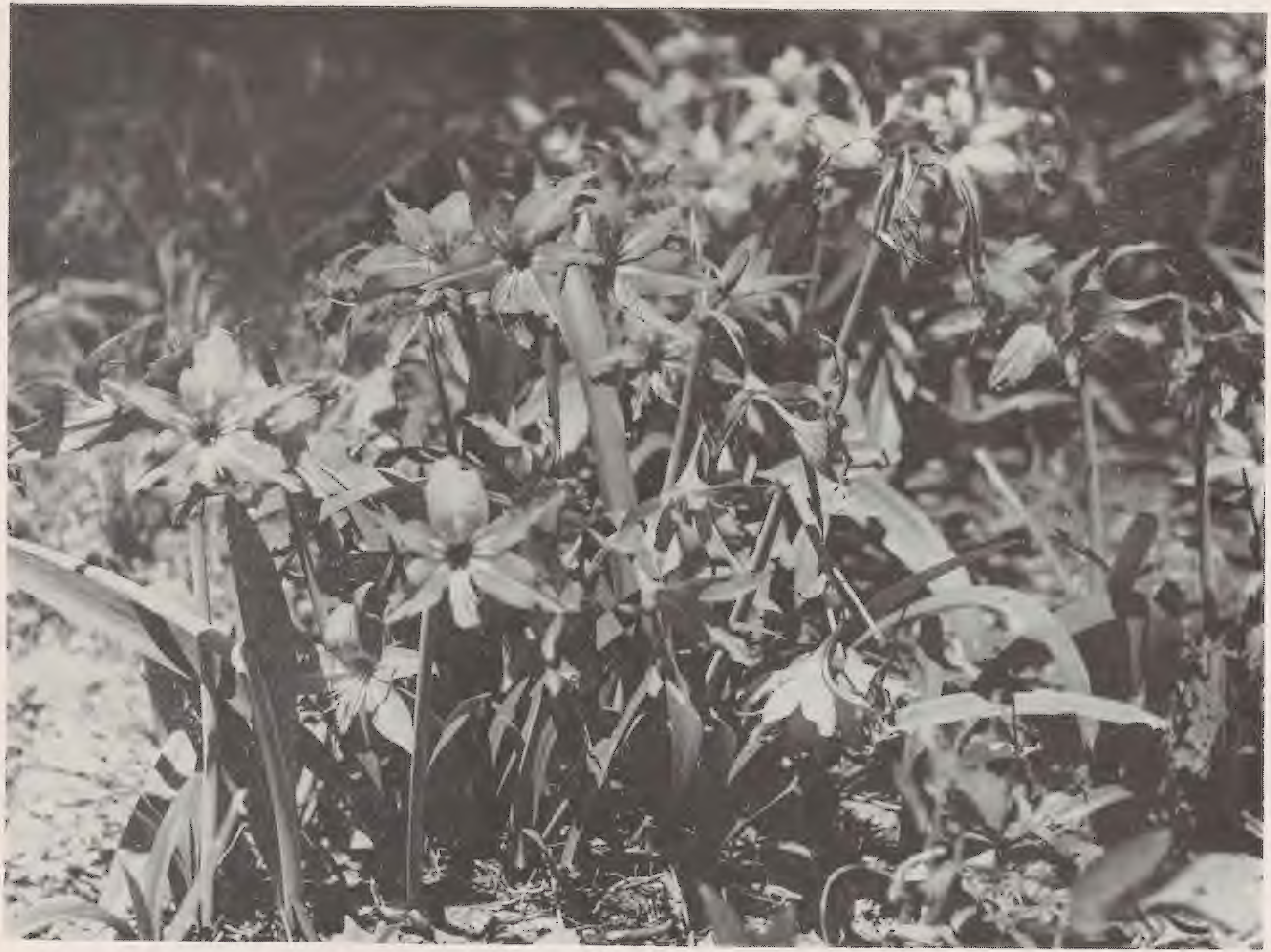


Fig. 10. *Zephyranthes* species, white keeled red outside; scape about 10 inches tall; about 43 mi. N. E. San Luis Potosi; Clint ♯M-434. Photo Mrs. Morris Clint (5-17-54).

After our return from Aguascalientes, we took stock of the situation. We had accomplished our main purpose—to find *Z. concolor* in bloom—and had seen ''Mayitos'' in so many variations that our heads were still spinning. Our only regret was that we had failed to locate *Z. verecunda,* but we felt that the rains had been too light and too intermittent to justify further search for this species, so decided to leave for home the next morning, though we were a day ahead of schedule. Our phenomenal luck rode with us the next morning, for we again saw the white *Zephyranthes* species in bloom on the rocky strip about 45 miles north of San Luis Potosi. We were delighted with the flowers, which were some of the loveliest and most distinctive of all the ''Mayitos'' seen on the trip. They were well formed and graceful—pure white except for a distinct stripe of bright red down the center of the segments on the outside of the flower. [Fig. 10] No other confusing forms were to be seen. This time, we were able to take good photos, though it was still a little early in the morning for perfect color rendition.

The valley of Puerto de Lobos seemed as dry as before but a few miles farther, as we rounded a sharp curve in the mountains, we spied a few *Zephyranthes* flowers among the large boulders. Once more Fred was privileged to see *Zephyranthes* in bloom on the mountainside. They proved to be a small familiar form, much farther east than we had ever seen them, but still on the dry side of the range. As we entered the edge of the rain forest, we saw that the rain we had encountered several days before had obligingly bloomed still more flowers for us. This last gesture of Lady Luck made our trip complete, for some of these last blossoms were very close to the described type of *Z. clintiae.*



Form of **Amaryllis belladonna** L., collected 20 mi. N. E. of Santa Cruz, Bolivia, at the Hacienda Souce. Photo by Ira S. Nelson, 1954.
Plate 3

SEARCH FOR NEW **AMARYLLIS** BREEDING STOCK

IRA S. NELSON, *Professor of Horticulture*
Southwestern Louisiana Institute, Lafayette

On August 1, 1954, I began an *Amaryllis* collecting trip which led me through Panama, Colombia, Ecuador, Peru and Bolivia during the following three months. My main objective was the Bolivian *Amaryllis* species which Mrs. Donald V. Applegate had reported seeing near Santa Cruz, Bolivia. The recently organized Louisiana Society for Horticultural Research sponsored the trip as its first project. Mrs. U. B. Evans, President of this organization had already received samples of Bolivian *Amaryllis* from her daughter, Mrs. Applegate, so prospects of finding something good seemed assured.

By hedge-hopping down the South American continent, I was able to do some collecting enroute to Bolivia. Since the purpose of the trip was to bring back bulbs not already available to hybridizers, I took every opportunity to procure them whether from the wild or from cultivation.

Armed with a copy of "AMARYLLIDACEAE: THE TRIBE AMARYLLEAE" by Traub and Moldenke and an abundance of ignorance concerning how to find *Amaryllis* in South America, I landed at Panama City ready to begin my search. During the day and a half between planes I visited the botanical garden in the Canal Zone and commercial nurseries where I procured a few amaryllid bulbs.

The flight to Bogata over the lush tropical vegetation hardly prepared me for the cold arid climate of that capital city. It was here that I was really convinced that the torrid zone can be cold and that climate in it depends upon the altitude.

Dr. A. Durand, of the University of Bogata, briefed me on the *Amaryllis* of Colombia. His assistant Roberto Jaramillo went with me to La Florida, about thirty miles northwest of Bogata where we found what he tentatively identified as *A. andreana.* This has since been identified by Dr. Traub as *Brunsvigia rosea* and was therefore introduced from South Africa. It is a rather showy species of rose pink color which shades to near white in the throat. We found it growing near the mountain top on the grassy slopes exposed to full sun. The area is one of heavy rainfall and cool weather the year around. The soil consisted largely of decayed organic matter which was so completely decomposed that it was rather heavy. The altitude at this location is about 8,700 feet.

Attempts to collect *Amaryllis* in other parts of Colombia were unsuccessful. The Quito region in Ecuador likewise yielded nothing so I moved on to Lima, Peru, where Dr. Ramon Ferreyra of San Marcos University generously gave me bulbs of three unidentified species which he and others had collected. From here I flew to Cusco, Peru, and obtained two more unidentified *Amaryllis* species from Dr. Cecil Vargas of Cusco University.

While in the Cusco area I was able to procure *A. forgetii* at Limatambo. It had been grown there in cultivation for about 30 years.

originally coming from the nearby mountains. I was unable to find it in the wild, but was happy to get it at all. Its deep red color and contrasting snow white pistil and filaments should make it valuable to hybridizers.

After crossing the alto plena, Lake Titicaca, and more Andes, I finally arrived at Cochabamba, Bolivia. Here I was able to get 4 unidentified species collected by Dr. Martin Cardenas of Cochabamba University. I may have collected duplicates of some of these in the surrounding mountains but have no way of knowing until after they bloom. In addition to these I purchased 8 bulbs of *Amaryllis* from Ricardo Dillman of Cochabamba. These were not in bloom at the time but he told me that he had collected them at Chimarie in the Beni region at about 1000 feet elevation. From his general descriptions I believe one of them must be a *Sprekelia* species rather than an *Amaryllis*. Before leav-

Fig. 11. Collecting the salmon colored form of *Amaryllis belladonna* L., in the deciduous jungle 20 mi. N. W. of Santa Cruz, Bolivia. Photo Ira S. Nelson, 1954.

ing Cochabamba I finally prevailed on an Indian woman to sell me bulbs of a long-trumpet sort that she was selling as cut flowers in the market.

The *Amaryllis* of the Santa Cruz, Bolivia area were the main object of the trip. Although they were not what I had expected, they were in no way disappointing. *Amaryllis belladonna* was in bloom when I arrived. [Plate 3] Variations of it in shape, size, and color certainly were as great as could be expected within any given species. I easily found *A. belladonna* growing on the sandy plain in full sun, and in recently cleared, deciduous jungle land [Fig. 11] which was planted to crops. With more difficulty I found it amid the heavy under growth of the deciduous jungle. Pink, salmon, orange and shades of tomato red were collected. [Plate 3] All of these had white or green and white throats. With these I found a few cream whites which I feel must also be a variation of *A. belladonna.*

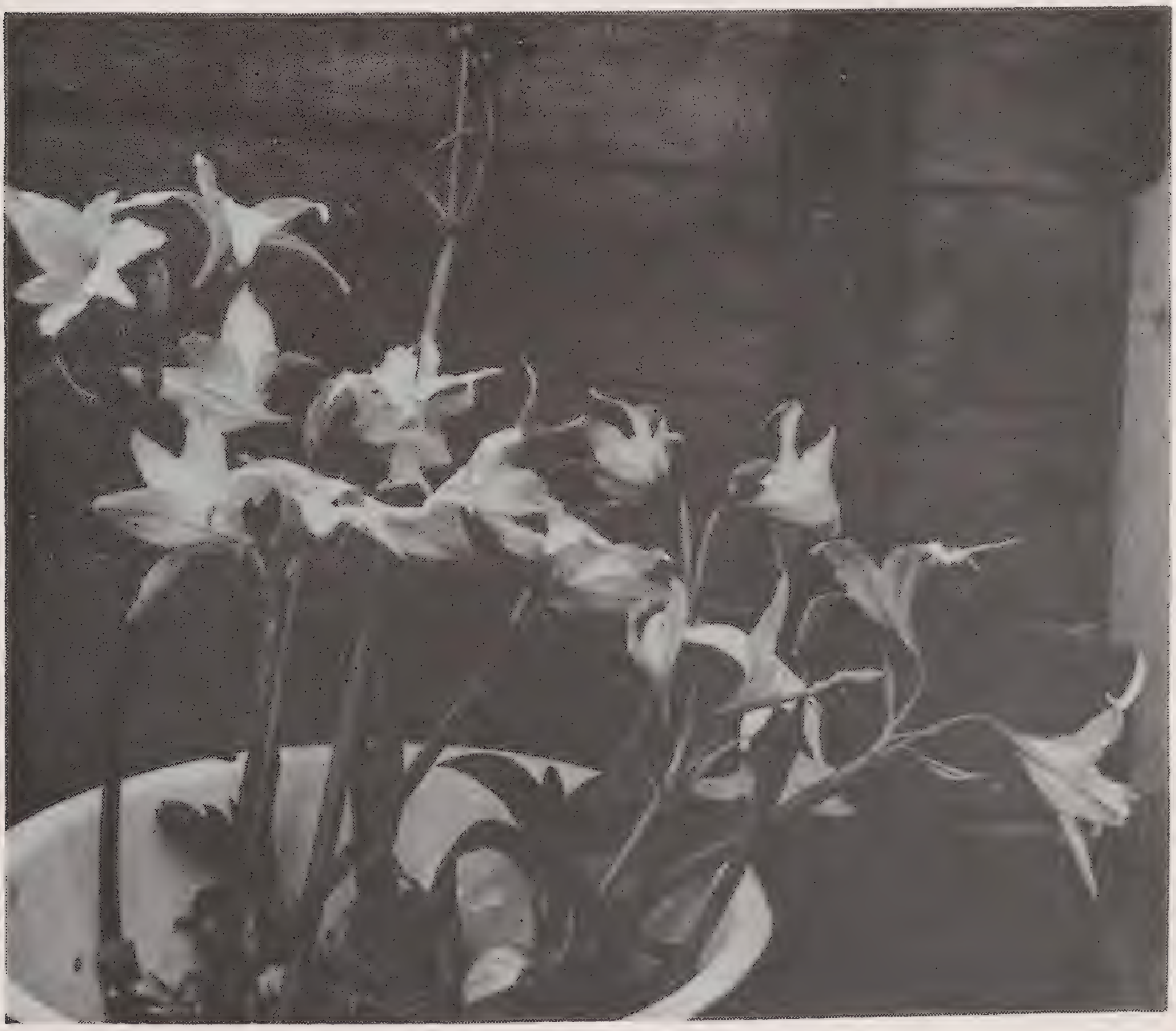


Fig. 12. Pale yellow form of *Amaryllis belladonna* L., collected near Santa Cruz, Bolivia. Photo Ira S. Nelson, 1954.

The most exciting find was a series of such variations resembling *A. belladonna* in most characteristics except color and color pattern. Some few of these were growing with belladonnas but most of them were not found close to typical belladonna populations. The range of color variation extended from a cream white to pale yellow. [Plate 3 & Fig. 12] Most of them developed a pink blush after opening. Some exhibited green throats, others yellow throats. A few clones had a pink outline of a star in the throat. *The flowers of only one clone had stigmas distinctly trifid,* all others had an obscurely 3 lobed but capitate stigma.

The habitat in which this series was found growing varied from 500 to 2000 feet in elevation and from sandy open plains to accumulations of almost pure leaf mold deposited on the mountain sides. A few clones were growing in full sun; however, most of them were found growing in rather dense shade in deciduous jungle. The soil was always light and well drained. One clone of these blushing amaryllis was growing between bromalids on a small rock ledge on the side of a cliff. The roots were sparsely covered with rotting leaf mold but the bulbs were entirely exposed to the air.

Due to the day-to-day color change of these blushing *Amaryllis* I could never be sure whether I was seeing a new one or whether I was merely seeing a different color phase of one already collected. I am confident that I brought back at least a dozen that are distinctly different and there is a possibility that I have doubled or tripled that number.

The blushing *Amaryllis* from Santa Cruz justified the entire trip. They are delicate of color, graceful of form and of a size that should be useful for both garden and cut flower purposes. Certainly they are a new departure from the *Amaryllis* known in the States.

In the Santa Cruz area two additional *Amaryllis* were obtained from cultivation. One, a relatively long-trumpet sort was white with pink stripes. The other, which was also found growing wild had a medium length trumpet. It closely resembled the description of *A. pardina* except that some of its minute red dots were arranged in streaks radiating from the throat. This one was found growing on level sandy land recently cleared of deciduous jungle. [Fig. 13]

At Comarapa, Bolivia, situated at 7000 feet elevation, I collected a small *Amaryllis* which has green flowers streaked with red. It was found growing in deposits of sand and rotting leaves that had accumulated during high water in the scrub undergrowth along the banks of a mountain stream. The exposure was one of shade during the growing season and partial sun during the winter.

From an abandoned yard in a construction camp in Comarapa, I found a distinctive, medium-size *Amaryllis* which was bright red and had a white star in the throat. I was told it probably came from the mountains through which the new road had just been built. No positive information could be obtained about its origin.

On my flight home I had the good fortune to locate 3 additional *Amaryllis* in cultivation at Cuenca, Ecuador. Duplicates were obtained from an Indian woman in the market. I could not get any information concerning their origin but they were different from the others I already had. With this last acquisition I had the satisfaction of getting bulbs from every country visited.

Other plant material was collected as a secondary project to the *Amaryllis* search. It includes other amaryllids, orchids, bromeliads, foliage plants and seed of many kinds. All the material will be propagated and eventually made available through commercial sources. Meanwhile it will be channeled into research projects. Positive identification of this plant material will necessarily have to wait until sufficient study of it can be made.

The Aymara Indians call the *Amaryllis* ''horra-ho-ray-chee.'' This of course is the phonetic spelling. I was told that before the days of modern cosmetics the Bolivian girls would rub the juice of the bulbs on their cheeks to give them color. For one night their complexion would glow with radiant beauty. In the several days that followed, however, they would have to remain out of sight of their lovers because their cheeks would be drawn, cracked and as rough and ugly as they had been glamorous on the night the juice was applied. One of the older women summed it up by saying ''thank God for Max Factor.''

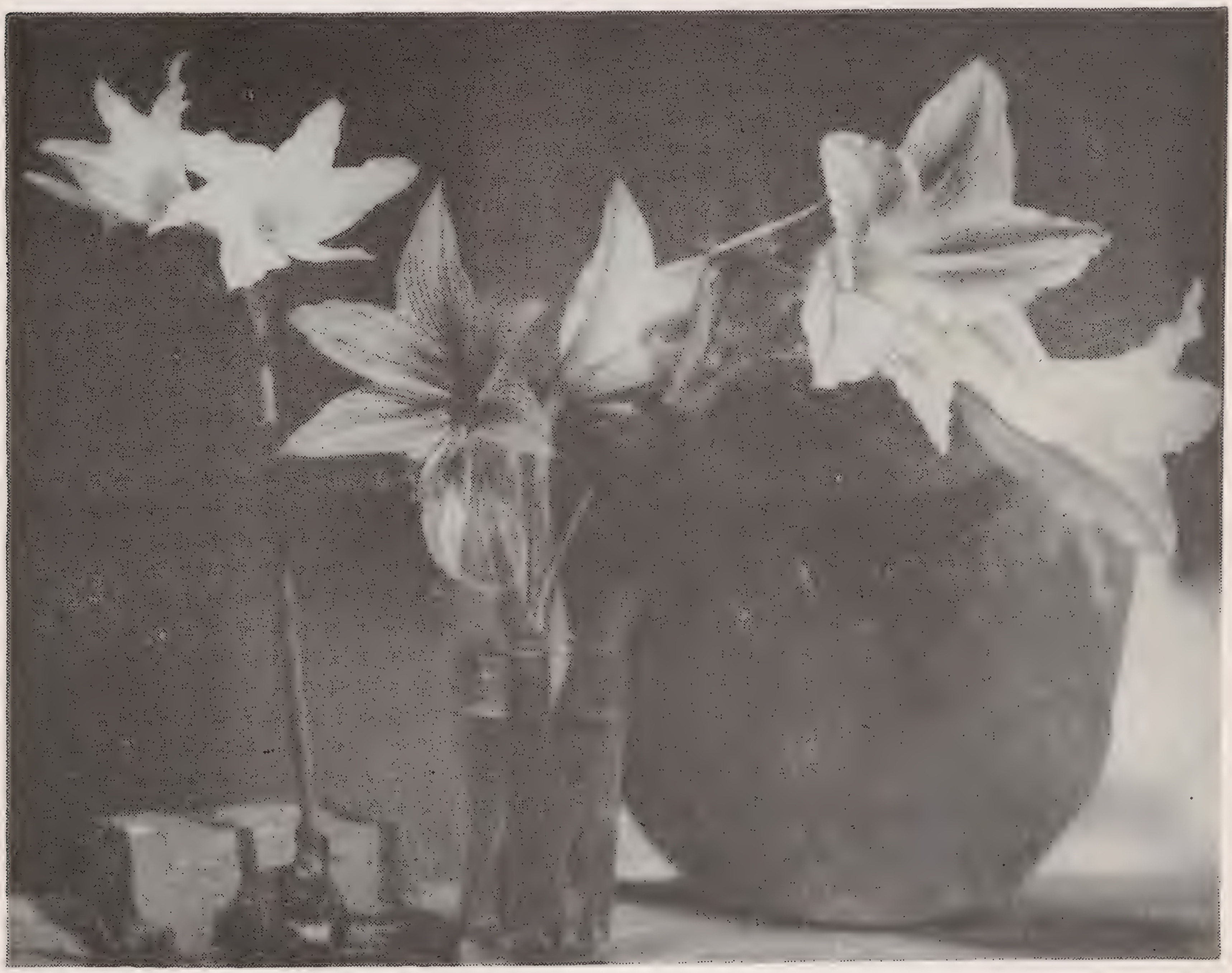


Fig. 13. Three unidentified *Amaryllis* species, from the Santa Cruz area, Bolivia. Photo Ira S. Nelson, 1954.

A total of 900 bulbs were brought back most of which were *Amaryllis*. I do not know how many of the variations are valid species, since some were not in bloom when I got them and others did not fit the descriptions I had with me. In retrospect I feel that I had more than my share of good luck to locate so many kinds. South America is a tremendous area in which to hunt for *Amaryllis.* The problem of finding them was like finding the proverbial needle in a hay stack.

DAYLILY NOTES, 1954

Hamilton P. Traub, *California*

Dr. Norton's 'Artemis' Daylily. The writer of this note was fortunate enough to possess a plant of Dr. Norton's 'Artemis' daylily which turned out to be the outstanding diploid daylily by far of those seen by him during the 1954 blooming season in this part of California. Since it is generally true that daylilies that can withstand the conditions here are even showier when grown in the East and Southeast, it can be predicted that 'Artemis' will surely take a leading position in future daylily lists. It is of the chastest light yellow (Aureolin RHS 3/2), and is sunfast. The setsegs are pointed and slightly twisted in the upper part, but the petsegs are oblanceolate and thus they have a completely rounded tip (apex). The arrangement of the tepalsegs is quite regular as contrasted with the usual two-sided arrangement in the ordinary daylily flower. This combination is novel and thus lifts it out of the class of the ordinary daylily flower shape. In his personal rating of daylilies it is placed at the very top for diploid clones. It would not be fair to compare it with the best of the polyploid (tetraploid) hybrids which are in a class by themselves. The best of these outdo anything so far achieved in diploids. However, among diploids, 'Artemis' is tops. In his estimation this daylily is a must for all daylily fanciers, particularly breeders. It is easily worth $25.00 or more per plant, that is if one can get it. The demand is far below the supply, and will remain so for a long time. Dr. Norton is to be congratulated for introducing this most beautiful daylily which will give pleasure to countless gardeners for an indefinite period.

The 'Pollyanne Carter' Daylily. This new clone, 'Pollyanne Carter' (Traub-Buck, 1954) is one of the seedlings produced by the writer and grown to flowering by Mr. E. Quinn Buck in California. It has been named for Miss Pollyanne Carter, of Massachusetts. The scape is up to 38″ tall. It is of the multiflora type with up to 30 or more medium-sized flowers per scape in well established plants. The most outstanding character about this clone is the brilliantly clear buttercup yellow (RHS 5) of the flowers, so bright that they outshine the others around them. The flowers open wide, about 4½″ across; setsegs are ⅞″ wide; petsegs 1⅜″ wide, edges slightly ruffled; fragrant; first flowers in early midseason and recurrent blooming (mid-July) in California.

The 'Winged Victory' Daylily. This new clone, 'Winged Victory' (Traub, 1955) is of medium height; flowers very large, petsegs a brilliant, clear lemon yellow (RHS 4/1), somewhat creped, and ruffled on the edges, and longer than the setsegs, which are a clear buttercup yellow (RHS 5/1); fragrant; early midseason, and recurrent blooming (late July and August) in California.

FLOWERING HABIT OF AMMOCHARIS

L. S. Hannibal, *California*

It was some ten years ago that the writer flowered *Ammocharis heterostyla* from Mount Elgon in Kenya. Neither this species nor another small pale white form were to be considered good garden material, so no tears were shed when the bulbs failed to adapt themselves to the thin sandy soil with oak leaf mulch enrichment, or to the prolonged moist spring weather which prevails here in the foot hills of the Sierra-Nevada mountains east of Sacramento. But where one species fails the larger *A. coranica* has made a striking growth. It was with considerable pleasure that we welcomed its large scarlet Nerine like blossoms—If only the bulb were not such a shy bloomer; it would be a wonderful garden plant.

In all instances when *Ammocharis* has flowered, usually in August or September, two scapes have developed from each bulb, usually within two or three weeks of each other. Mental note of this was made ten years ago when *A. heterostyla* first flowered that this was a *Crinum* characteristic, and the affinity of *Ammocharis* to *Crinum* was more apparent when it was found that the flowering buds of each arise four leaf axels apart. At least this holds true with the *Ammocharis* species that have been observed and the several *Crium* species examined. However the genus *Crinum* is a large one so there could be variations from this periodic arrangement.

A careful search of the literature, including E. Milne-Redhead & H. G. Schweickert's lengthy report on the genus *Ammocharis* disclosed no mention of the double scape behavior. Actually this feature may be more basic than floral structure, and therefore is a distinctive divisional feature which can be used to segregate *Crinum* and *Ammocharis* into a multiple scape class, and *Nerine, Boophone, Brunsvigia* proper, and *Brunsvigia* section *Coburgia* Herbert (1819) into a single scape class. The only unknown to me of this South African tribe of *Amaryllidaceae* is *Cybistetes longifolia* (ex *Ammocharis falcata).*

This latter plant is quite rare and is confined to an area about table mountain that is now fairly well settled, so the species is rare. If *Cybistetes longifolia* does throw a singe scape, as the John Martley article on Page 225 of the 1939 Herbertia leads one to believe, then this species may be more closely allied to *Brunsvigia rosea* (section *Coburgia* Herbert 1819) or *Nerine* than previously supposed. The separation of the scape from the basal plate, which permits it to roll away and scatter seed as in some species of the Brunsvigia is caused by the leaf growth which starts very soon after flowering. It is not a sound generic feature. [A common occurrence with numerous *Brunsvigia rosea* hybrids and *B. appendiculata.*]

We cannot draw many conclusions from the flowering habit in the single scape genera. *Brunsvigia rosea* (Sect. *Coburgia)* and the lorate leaved *Brunsvigia* normally produce a complement of eight or nine leaves, The lingulate leafed type *Brunsvigia* usually exhibit five; *Nerine* may have five or six; *Boophone ciliaris* produces four leaves whereas *B. disticha* exhibits 12 to 15. All of these species must produce a full compliment of leaves if a flower bud is to be anticipated in the following fall.

AMARYLLID NOTES

Hamilton P. Traub, *California*

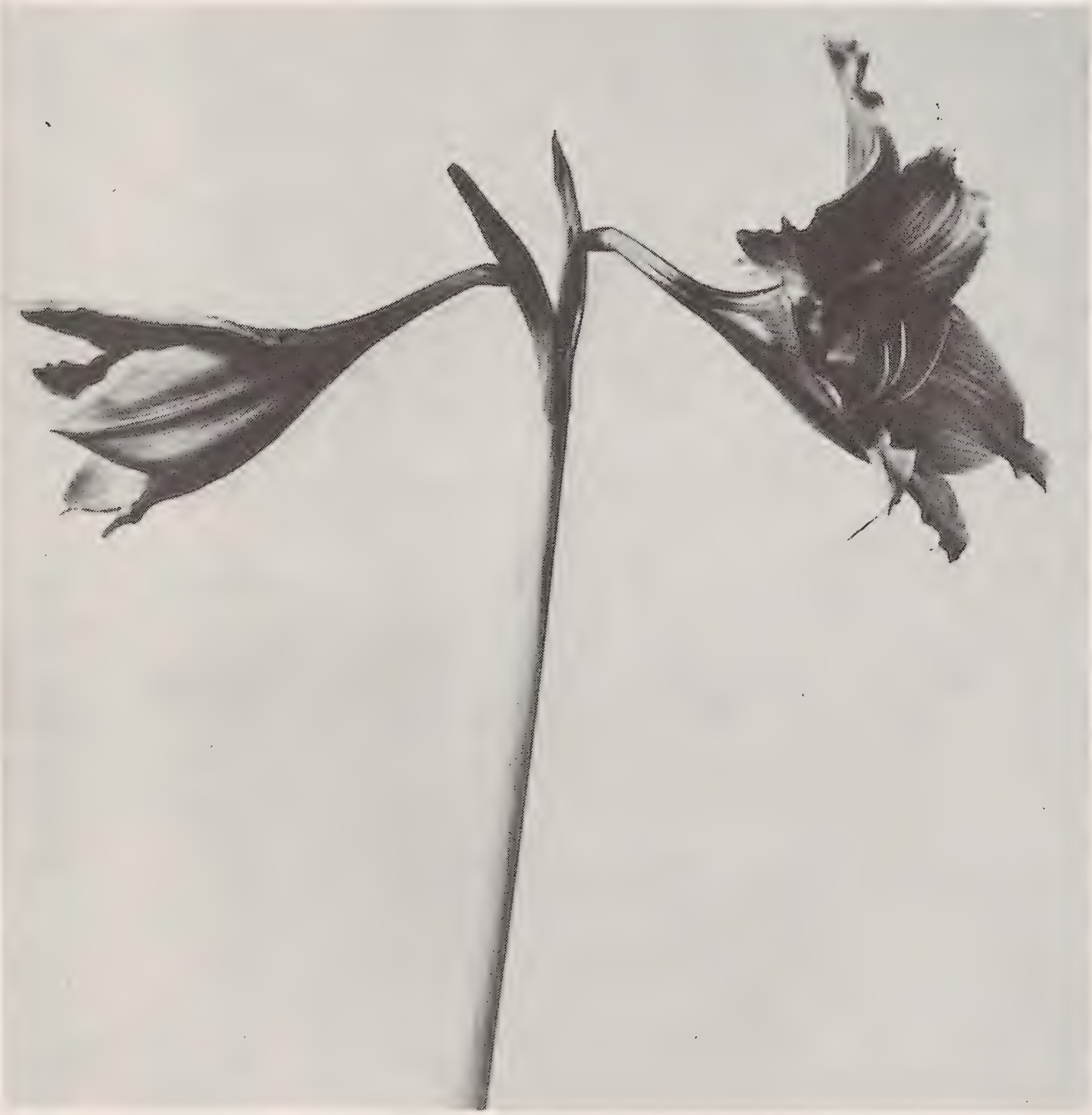


Fig. 14. Form of *Amaryllis belladonna* L., collected by the late Dr. H. P. Pittier, of Caracas, Venezuela, in the Llanos de Araure, Acarigua, State of Portugesa. Photo by Dr. H. P. Pittier, made in 1930's.

Range of Amaryllis belladonna L. In the 1930's, the late Dr. H. P. Pittier, of Caracas, Venezuela, sent a photograph (see Fig. 14) of a plant he had collected in Llanos de Araure, Acarigua, State of Portugesa, "eastern foot of the Andes." This definitely extends the range of this species into Venezuela.

AMARYLLIS PRE-TREATED FOR EARLY FLOWERING. In 1954 Herbertia, a report was made on a bulb pre-treated by a Holland firm for early forcing. This brief note is made to bring the report up to date.

By April 28, 1954, the 8 leaves had reached a length of 36″, and were very beautifully arched so as to form a plant about 26″ tall, and with a spread of 49″. The leaves ranged from 2½ to 3 inches wide, they are channeled on top, with a blunt apex. The plant was a wonderful show-specimen, even when not in flower, until the 1st week in August, when the leaves declined, and soon died back. At the same time, however, 4 new leaves quickly appeared. In October, 3 additional leaves were produced, and thus the plant was again a wonderful show specimen. In spite of the fact that the bulb had been forced for Christmas, it increased markedly in diameter.

It should be noted that the plant was grown continually in the same clay pot which was placed inside of a green-glazed ornamental pot. It was placed on the floor on the south side of a living room provided with floor to ceiling glass doors. The floor was provided with radiant heating from water in copper pipes, and the temperature never was allowed to go below 72° F. This appeared to be the ideal conditions for growing *Amaryllis*.

In spite of such successes with pre-treated bulbs for early forcing during the Christmas season, the Holland growers report that such bulbs are not much in demand in America. In Europe they find a ready market. It is hoped that Amaryllis enthusiasts in America will avail themselves of this opportunity in the next holiday season.

RECENT ADVANCES IN HEMEROCALLIS INTRODUCTIONS

PHILIP G. CORLISS, M.D.,
S. W. Reg. Vice-Pres., Somerton, Arizona

One of the most important factors in daylily breeding in recent years is the recognition by breeders and fanciers that there is a great difference in regional performance of the new hybrids. In all parts of the country, hybridizers are still working for larger flowers, new patterns and colors, resistance to fading, and longer duration of the life of the individual flowers. In addition, the breeders in the cold climates, where only a single blooming period is expected, are working for increased branching (more buds and longer bloom period) and earlier and later blooming varieties to lengthen the daylily season. In the deep south, on the other hand, there is more attention to continuous or remontant bloomers, where a scape with fewer stumps and pods is quickly followed by another with fresh flowers and buds.

In pursuit of new colors, the interest in pink, blue, black, and white continues unabated. There is a great demand for flowers with green throats, which suggest coolness to many gardeners in the period of midsummer heat when daylilies are at their best. [For my part I would prefer bright red throats, but such a flower has not appeared nor does it seem to be the goal of any of our breeders.]

Mrs. Nesmith has recently offered several descendants for her 'Pink Prelude' which are an improvement over earlier pinks in size, color, and refinements of form and texture. Among the best may be mentioned her 'Mayflower' and 'Her Majesty.' Mr. J. C. Stevens has some nice pinks to follow his 'Pink Damask,' and Mr. Frank Childs is offering some companion pinks to his 'Pink Dream.' Among the breeders of evergreen types in the deep south, Mrs. Bright Taylor has some vigorous pinks of colder tone than her popular 'Pink Bowknot,' and the Baton Rouge breeders will astound the daylily world with their many new pink hemerocallis at the 1955 meeting.

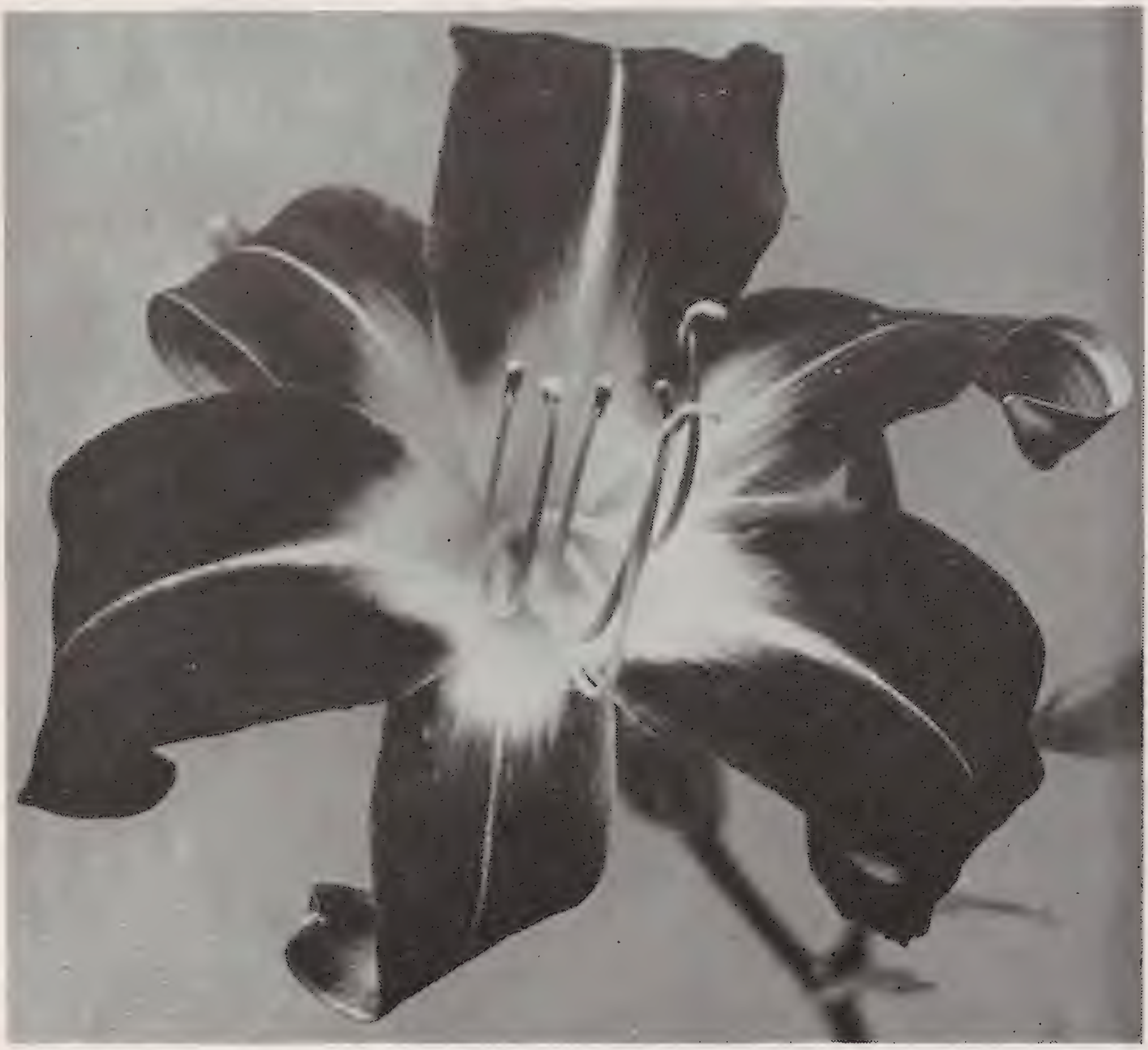


Fig. 15. Hybrid Daylily, 'Gulf Purple' originated by Mrs. Will Land of Beaumont, Texas. Photo by Dr. Philip G. Corliss.

There are no real blue daylilies yet (don't be misled by some of the names!) but from Mrs. Nesmith's 'Canyon Purple' and Mr. Ralph

Wheeler's several blue-toned flower ('Amherst,' etc.) are coming some nice blue-purples. Perhaps the largest bluish flower yet seen is Mr. Hooper Connell's (Baton Rouge) 'Blue Horizon.'

Many hybridizers are getting very dark daylilies. Mrs. Bright Taylor's 'Royal Envoy' and Mrs. Robert Schlumpf's (Houston) 'Black Knight' are examples of the best new "black" hems, and from a newcomer, Mrs. Will Land of Beaumont, Texas, we have 'Royal Mantle' and 'Gulf Purple.' (Fig. 15) Mr. Henry Sass's 'Convoy' is one of the best dark hems now available in good supply.

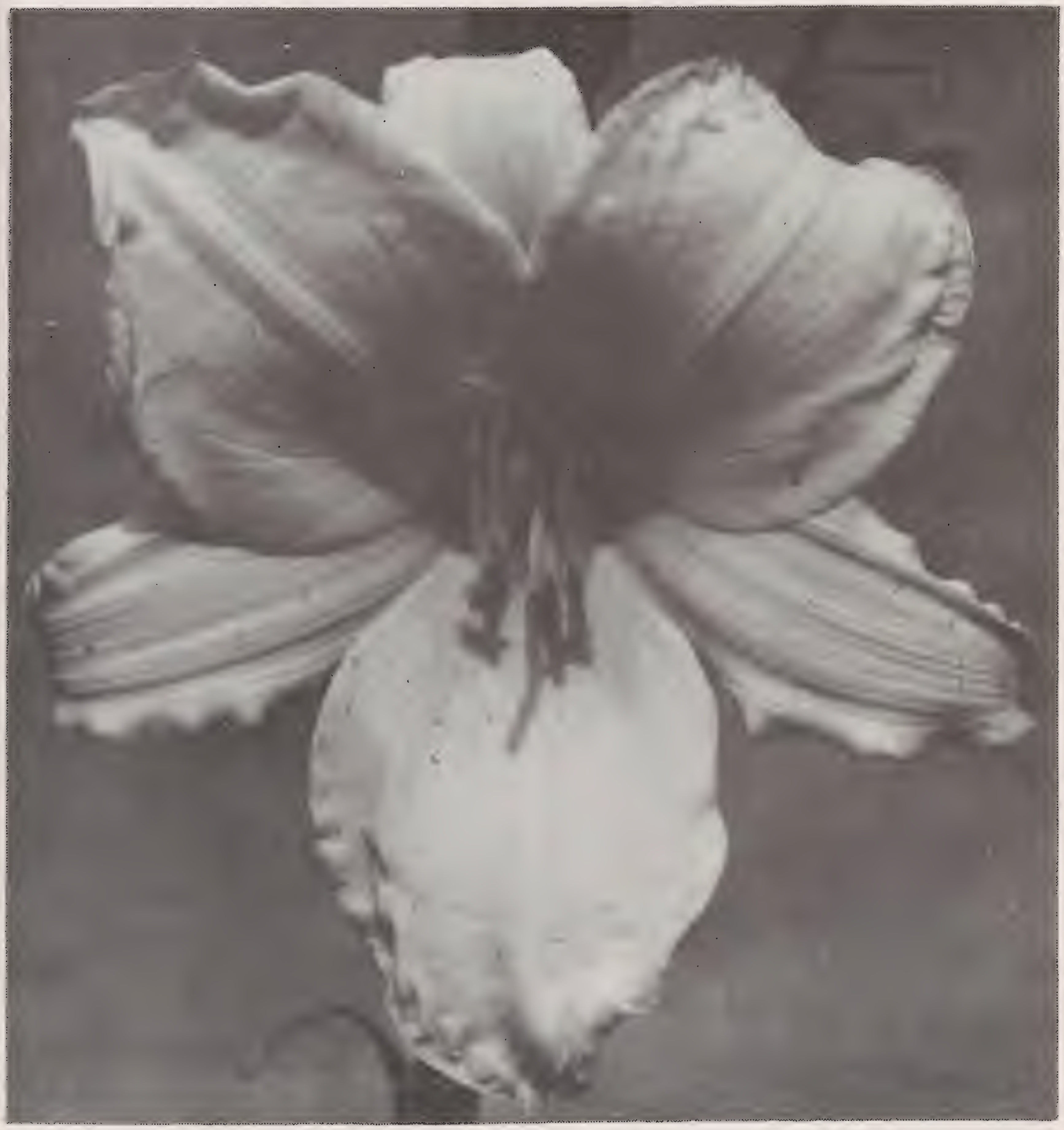


Fig. 16. Hybrid Daylily, 'Moonlight Tryst' originated by Tom Craig. Photo by Dr. Philip G. Corliss.

To date the closest approach to white is seen in the pale yellow daylilies. Mrs. Nesmith's 'Carved Ivory' was a great stimulus to breeders. The late Mrs. William Bach of Bloomington, Illinois, was a couple of generations ahead of most hybridizers with her 'Snowy Egret' which is now joined by the much lighter 'White Orchid,' 'Gracie Lanore,' 'White Elf,' 'White Triangle,' 'Blanch Lafitte,' and 'White Tower.'

The "green throats" are crowding the field of newcomers. The sight of the late Mr. Joseph House's 'Green Goddess' caused much interest in the green throat's but Mrs. J. F. Emigholz's 'Cool Waters' had been a favorite with all who knew it for some time. This last-named breeder is adding to her list this year 'Green Chalice' and 'Chamois Glow' which intrigued me as seedlings the year I named her big spider, 'Oliver Twist.' Among the host of excellent new varieties with striking green throats are Mrs. A. S. Gates' (Baton Rouge) 'Summer Orchid,' Mrs. Will Land's 'Gulf Sunshine,' and Mr. Tom Craig's 'Moonlight Tryst' (Fig. 16.).

REGISTRATION OF NEW AMARYLLID CLONES

Registrars: Dr. J. B. S. Norton and Prof. W. R. Ballard

This information is published to avoid duplication of names, and to provide a space for recording brief descriptions of new Amaryllid clones. Names should be as short as possible—one word is sufficient. It is suggested that in no case should more than two words be used. *The descriptions must be prepared in the form as shown in the entries below, and must be typewritten and doubled-spaced.* The descriptive terms used should be in harmony with those given in the "Descriptive Catalog of Hemerocallis Clones, 1893-1948" by Norton, Stuntz and Ballard.

There is close liaison between the AMERICAN PLANT LIFE SOCIETY and the HEMEROCALLIS SOCIETY regarding the registration of new *xHemerocallis* clones. By cooperative arrangement with the HEMEROCALLIS SOCIETY, beginning with the 1951 HERBERTIA edition, descriptions of only such *xHemerocallis* clones for which the registration fee has been paid to Registrar, Mr. Harry I. Tuggle, P. O. Box 1108, Martinsville, Va., will be registered, and numbered (example: 3322-R). The number "3322" indicating the number of the clone and the "R," the information that it is registered. The registration fee is required *only* in the case of *xHemerocallis* clones, and *not* for other amaryllids which are registered free of charge by the AMERICAN PLANT LIFE SOCIETY. It should be noted that in a free country such as ours, registration is *entirely voluntary,* and does not replace the right of anyone to publish names with descriptions in recognized publication media elsewhere and thus obtain priority under the generally recognized INTERNATIONAL CODE OF BOTANICAL NOMENCLATURE and the INTERNATIONAL CODE OF NOMENCLATURE FOR CULTIVATED PLANTS (1953) which cover all plant names.

Correspondence regarding new amaryllid clones, including *Hemerocallis,* to appear in HERBERTIA should be addressed to Prof. J. B. S. Norton, 4922 40th Place, Hyattsville, Maryland, *enclosing self-addressed, stamped envelope, if reply is expected.*

For obvious reasons, there is a limit to the number of descriptions included from any one member in any one issue. Not more than five brief descriptions of clones under each generic heading will be published from any one member in any one issue of HERBERTIA. Descriptions of clones in excess of five brief descriptions, up to a total of 25, will be entered if the space required for each is limited to one line. In this case use should be made of the standard abbreviations already mentioned.

THE AMERICAN PLANT LIFE SOCIETY numbers the clones known to be published, including those registered and not registered, in various publication media. It is thus an easy matter to report the approximate number of named clones as of any date. Such a report will be made as of July 1 in each year. On July 1, 1954, a total of 4791 hybrid *Hemerocallis* clones had been named.

HYBRID BRUNSVIGIA CLONES

Introduced by Mr. L. S. Hannibal, Fair Oaks, Calif.

Brunsvigia rosea clone 'Picotee,' L. S. Hannibal, *cl. nov*: A hybrid obtained by pollinating *B. multiflora* clone 'Hathor' (an H. B. Bradley seedling registered with the R. H. S. of New South Wales in 1911) with *Brunsvigia rosea* clone 'Frank Leach.' The 'Hathor' parentage contributed the wide ruffled petals and numerous blossoms. The 'Frank Leach' pollen parent also contributed to the ruffled effect, a slight *varabilis* effect where the shade of the blossoms deepens with age, a pronounced recurving of the petals, and last but far from least a pronounced tendency for the color to concentrate along the margins of the tepalsegs. This picotee effect has appeared in about 1% of the seedlings wherein the clone 'Frank Leach' has been used, but the combination with glistening ruffled tepalsegs is particularly outstanding.

Brunsvigia rosea clone 'Red Shadow', L. S. Hannibal, *cl. nov.* The parents used were a *B. rosea bicolor* and 'Hathor' (described above). The blossoms are similar in shape to *B. rosea major,* our well known west coast form, but the trumpet is pure white whereas the limb is a brilliant red (RHS Rose Red 724/3). The plant makes a striking show in the garden.

Brunsvigia Multiflora clone 'Glory,' Allister Clarke, *Cl. nov.* This fine Australian *B. multiflora* hybrid bears numerous large blossoms with oddly twisted petals. The tube of each flower is saffron yellow, turning orange in the throat where the rose and yellow shades blend. The margins of the tepalsegs are of a lighter shade than the mid area. The color combinations and flower shape suggest an orchid. Up to 39 blossome have been observed on a single scape. This striking plant came from a series of crosses made by Allister Clarke about a decade back.

HYBRID AMARYLLIS CLONE

Introduced by Mrs. Isabelle Parker, 424 Crawford, Biloxi, Miss.—

'Faith'. Flower delicate, white with about ⅛ inch border of red; flower about 8 inches in diam.; segs 5 inches long, reflexed; petsegs 3 inches, setsegs 2 inches wide; 2 blooms per scape; spring flowering.

HYBRID HEMEROCALLIS CLONES

Introduced by Stanley E. Saxton, Saratoga Springs, New York:

'Aflutter'. Flowers large, light purple and yellow bicolor; scape 38″; late midseason; evergreen.

'Island Song'. Flowers 6″ to 7″ flowers, opening flat; creamy-ivory, washed and streaked rose-pink, deeper at mid-petalseg; fading to cream at edge; setepalsegs less rose-washed than petepalsegs; scapes 30″; midseason; semi-evergreen.

'Kriss Kringle'. Pure, deep, velvety red, greenish-yellow at throat; star shaped flower; scape 42″; midseason to late; deciduous.

'Magic Morn'. Tepalsegs wide, shining rose-red self; fine growing habit; fuller in effect than others in same color class, throat golden yellow; scape 40″; midseason to late; semi-evergreen.

'Premium'. Very large, bright, coppery-gold flowers with cream midrib; petepalsegs 2″ wide; flower 6″ to 7″ in spread; scape 46″; blooms over long season.

AMARYLLID GENERA AND SPECIES

Harold N. Moldenke

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time so that these will be available to the readers.]

Brodiaea spegazzinii Macloskie. Thanks to the kindness of Dr. Alberto Castellanos, of Buenos Aires, we are able to present here a resumé of a curious nomenclatural mix-up involving several amaryllidaceous plants and plant names.

In 1897 Carlos Spegazzini proposed the binomial *Brodiaea patagonica* Speg., for an amaryllidaceous plant represented by and typified by his collection no. 362. In the same paper he proposed the binomial *Luzala patagonica* Speg., for a juncaceous plant typified by his collection no. 366.

Unknown to Spegazzini, however, Baker had proposed a *Brodiaea patagonica* (Baker) Baker in 1896. Spegazzini's name, therefore, was plainly a later and invalid homonym.

In 1902 Spegazzini proposed the binomial *Tritelaia patagonica* (Speg.) Speg., which he intended as a new combination for his *Brodiaea patagonica* of 1897. Unfortunately, however, he cited his no. 366 when he made the transfer (instead of no. 362).

Macloksie in his large work, ''Flora patagonica'' (1903-1906), recognized that Spegazzini's *Brodiaea patagonica* is a homonym, and so he re-named it *Brodiaea spegazzini* Maclos. However, he was misled by the citation of the wrong specimen in the *Triteleia patagonica* transfer and so assumed that Spegazzini was intending this as a new combination for his previous *Luzula patagonica*, based on that collection number. Macloskie, therefore, proposed for this supposedly second plant the name *Brodieae luzula* Maclos.

Hauman in Physis 3: 423—426. 1917, clarifies this situation and shows that Macloskie's binomial, *Brodiaea luzula*, is clearly based on an error and is to be reduced to the synonymy under *B. spegazzinii* Maclos.

Spegazzini himself in Physis 3: 265. 1917, changes his *Triteleia patagonica* var. *angustiloba* Speg., to *Brodiaea spegazzinii* var. *angustiloba* (Speg.) Speg.

[PLANT LIFE LIBRARY, continued from page 137.]

THE AMERICAN GARDENER'S BOOK OF BULBS, by T. H. Everett. Random House. New York. 1954. pp. 226. Illus. $5.95.

This profusely illustrated popular book on ornamental plants having true bulbs, corms, tubers, rhizomes or thickened storage roots is designed to provide information ''on the selection and uses of ''bulbs'' in gardens, as well as instruction on how to grow them.'' The second part of the book is in the nature of an alphabetical cyclopedia of bulb gardening.

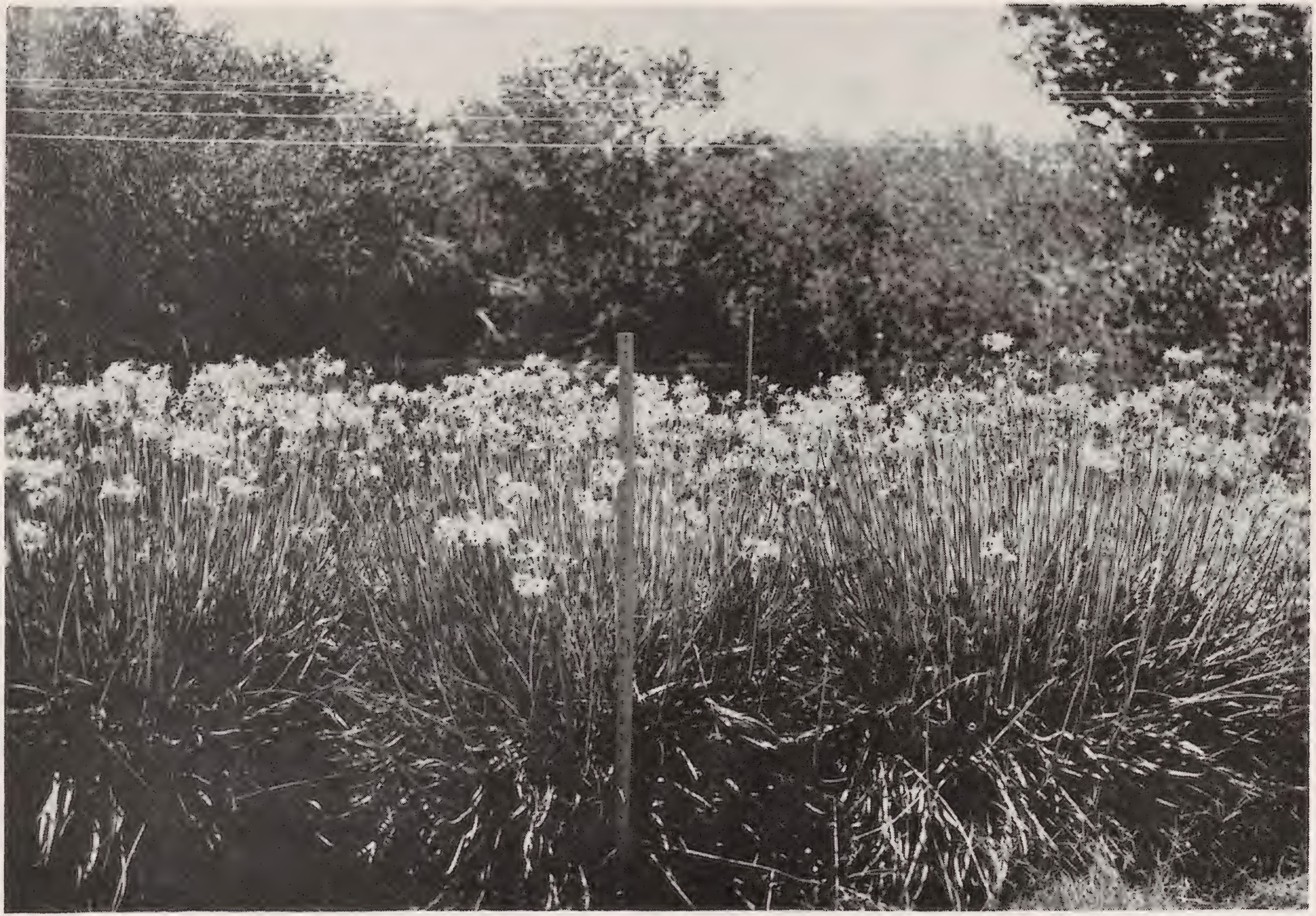
PRINCIPLES OF GENERAL ECOLOGY, by A. M. Woodbury. Blakiston Co., 575 Madison Av., New York. 1954. pp. 503. $6.00.

This stimulating new book ''is designed as a college text of general ecology at the upper division level. It may be of interest to other workers in the field and also the layman . . . It may be of special interest to research workers in many fields and to workers in applied fields such as forestry, agriculture, wildlife, limnology, oceanography, and others because it outlines a large field into which such activities fall.'' The material is presented in three parts (1) general considerations, (2) physical environment, and (3) biotic interrelationships. The illustrations are particularly outstanding. This is a most valuable, easily readable book on ecology which is indispensable to those interested in the subject.

BASIC BOTANY, by Fred W. Emerson. 2nd ed. Blakiston Co., 575 Madison Av., New York. 1954. pp. 425. Illus. $5.00.

This second edition of a standard text has been written like the first from a unified view showing the functions of the plant as ''phases of a single unit. This unit is protoplasm, the activities of which constitute what we call life. The various differences in physicochemical organization, and both structure and functioning are controlled by genes, influenced by environment.'' In this revision, greater stress has been placed upon applications to farm and garden with reference to growth

[PLANT LIFE LIBRARY, continued on page 80.]



Tulbaghia violacea in flower in Southern California. The meter stick indicates that each of the three clumps is at least 36" high.
Plate 4

3. GENETICS AND BREEDING

TULBAGHIA VIOLACEA—DESCRIPTION, CULTURAL AND CYTOLOGICAL OBSERVATIONS

THOMAS W. WHITAKER, *California*
and WALTER S. FLORY, JR., *Virginia*

Tulbaghia violacea Harv. is indigenous to Cape Province, South Africa. Hutchinson (1934) places the genus in the Amaryllidaceae, Tribe Agapantheae. Stenar (1933) has made an embryological study of *T. violacea,* and has found that the embryo sac follows the Scilla-Type of development. The ovules are hemitropous, without chalazal outgrowths; there is no covering cell over the embryo sac cell, and the pollen develops by successive delimitation. The chromosome number is given as $n =$ ca. 6-8.

Tulbaghia violacea is an elegant garden plant for many locations in Southern California [Plate 4]. We have been unable to find it adequately described under cultivation. For these reasons, we are recording a full description of the plants, and some cultural observations, along with a brief cytological note. The cytological data may be helpful to future investigators concerned with taxonomic studies of this group.

The slender, erect rhizomatous plants have leaves up to 45 cm long. The scapes may reach a height of almost 1 m in well grown plants. The long, narrow strap-shaped leaves are canaliculate at the base and about 1 cm in width. The umbel of 17 to 18 flowers is enclosed in two spatheous bracts, the longer one partially enclosing the shorter. The long bract is 28 to 32 mm in length, the shorter one 22 to 25 mm. The urn-shaped, lilac colored flowers are on slender pedicels 14 to 21 mm long. The corolla is imbricated in the bud, the three segments without scales overlapping the three segments with scales. The three scales form a definite corona, and are usually forked at the apex. The six anthers are attached directly to the tube (dorsifixed) at two different levels; the three upper anthers are attached to the segments with scales, the three lower ones are attached to the scaleless segments. The length of the tube (12 to 14 mm) is about equal to the length of the segments (11 to 12 mm).

The fruit is a capsule, with three locules. Each locule contains from 7 to 9 ovules, but under our conditions only one or, at the most, two ovules produce mature seed. As a rule one locule is completely sterile, the other two locules produce from one to two seeds each. The seeds are jet black, 8 mm long by 3 mm wide.

CULTURAL OBSERVATIONS

The plants do well in full sun, in light, porous well drained soil. While they do not require much moisture to barely exist, they respond very nicely to regular irrigations during the dry summer and fall months. The application of a complete fertilizer at least once a year will maintain the clumps in flowering condition almost continuously except during the winter season. For best growth the clumps should be thinned periodically.

As a garden subject, *T. violacea* has several good points; (1) the seeds germinate readily without the use of special techniques; (2) the plants increase vegetatively, rather rapidly; (3) the plants are easily adapted to pot culture, hence can be used for decorative purposes in patios, on verandahs, or in lathhouses and greenhouses.

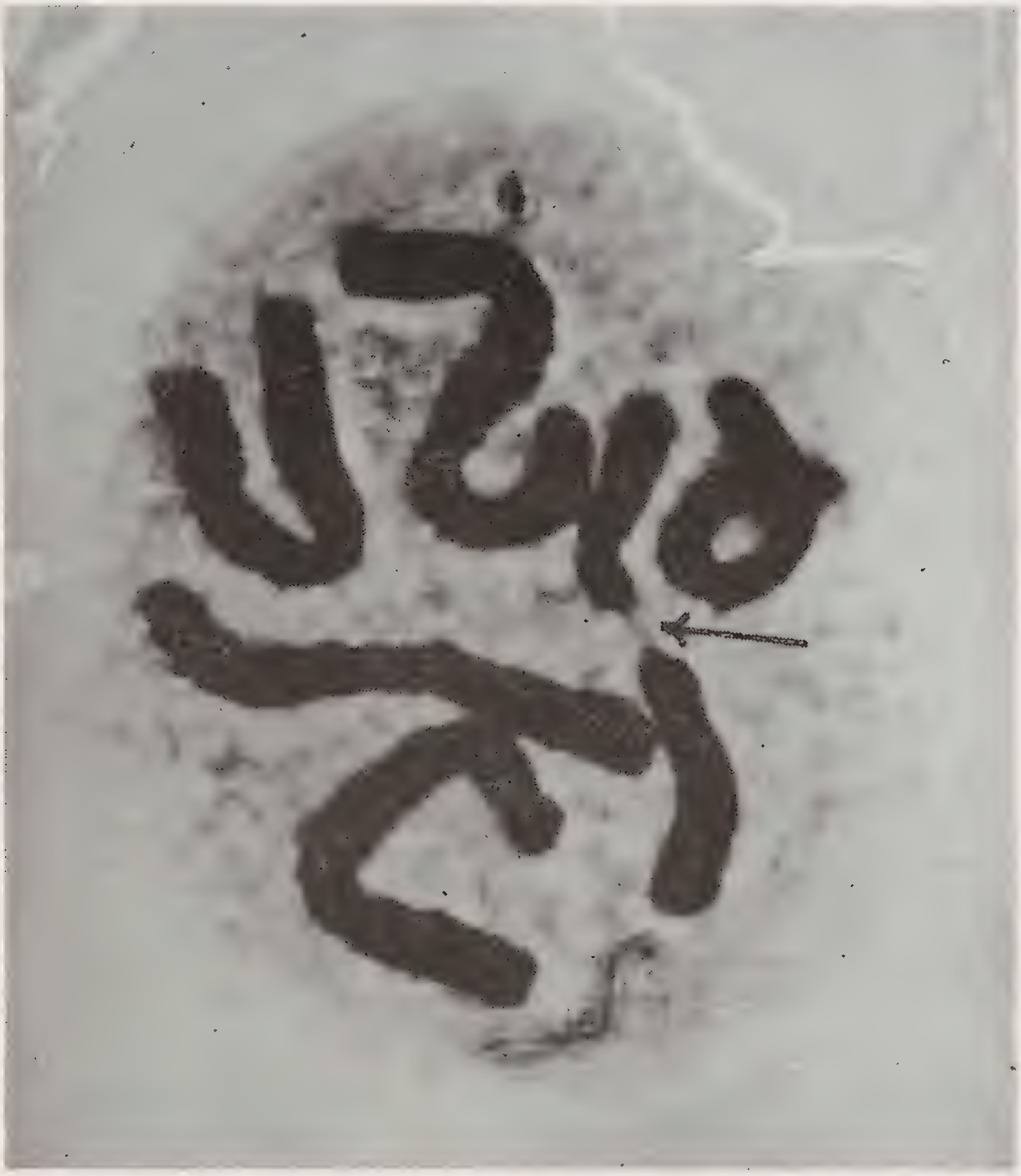


Fig. 17. Pollen grain of *Tulbaghia violacea,* showing six chromosomes. Arrow shows large euchromatic block in centromere region on one chromosome. (X2500)

In Southern California, *T. violacea* can be grown the year around out-of-doors. Likewise, it can probably be treated in the same manner in most of the Southern States where there is adequate summer rainfall and good soil drainage.

Over a period of five years, our plants have been exceptionally free of insects, plant diseases and other pests. For many people, the most objectionable feature of *T. violacea* may be the mild ''garlic'' odor emitted by the plants. However, the masses of bright lilac flowers, and glossy green foliage more than compensate for this defect.

CYTOLOGICAL OBSERVATIONS

Tulbaghia violacea has six pairs of chromosomes, of about equal length, and with median centromeres (Fig. 17). The distinguishing feature of the chromosome complement is the pair characterized by a relatively large block of euchromatin adjacent to the centromere in each arm of the chromosome.

Examination of root tip cells of *Tulbaghia fragrans* Ver. and *T. cepacea* Linn. each with 2n = 12, indicates that these species have a chromosome pair that corresponds to the ''euchromatic'' pair described for *T. violacea*. In both species there are four pairs of chromosomes with median, one pair with submedian, and a sixth pair with sub-terminal centromeres.

The ''euchromatic'' pair of chromosomes characteristic of all three species suggests that differentiation of the chromosome complement may have generic significance in taxonomic studies of this group. Bailey (1954) in studies of the chromosome morphology of *Trillium* species finds a similar euchromatic region in the B chromosome of *T. undulatum*, or as he terms it, ''a non-staining segment of reduced diameter.'' He suggests that the centromere acts as a region of differential reactivity which is usually associated with chromosomes exposed to cold treatment.

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SEED COLOR INHERITANCE AND BREEDING PATTERNS IN **BRUNSVIGIA x MULTIFLORA** HYBRIDS

L. S. Hannibal, *California*

The *Brunsvigia* x *multiflora* group of hybrids were first listed in the nursery catalogues of John Baptist and Sons as *Brunsvigia multiflora alba, B. multiflora pallida,* and *B. multiflora rosea,* 1865 to 1880. These latinized names have likewise been used in the horticultural reports and gardening articles issued by the Sydney branch of the Horticultural Society of New South Wales. In keeping with the 1953 rules of nomenclature for cultivated plants and the recommendations on page 3 of the January 1955 R. H. S. John Baptist's cultivar name is modified as indicated above. *Brunsvigia* x *multiflora* is an invalid name according to the rules because there is the earlier *B. multiflora* Ait., but for the present, the former will be used since the "x" will be sufficient to avoid confusing the two.

The taxonomic features which set this particular group of hybrids apart from *Brunsvigia rosea* are the blunt glaucous leaves, which are well sheathed in a pronounced pseudo stem, the radial arrangement of the individual flowers on the umbel, the numerous flowers (up to 30 or more), the slight declination of the filaments, and the late flowering habit. Excluding the pseudo stem *Brunsvigia* x *parkeri,* an allied hybrid, which displays none of these features.

The G. K. Cowlishaw report on the Australian *Brunsvigia* x *multiflora* group of hybrids, which was published in the 1935 Herbertia did much toward stimulating an interest in these attractive bulbs. Since that date a score of individuals have imported these plants and there have been a variety of breeding experiments undertaken with varying results. The writer's interest dates from 1940 after observing the white flowered forms at Mr. Orpets nursery in Santa Barbara.

Mr. E. O. Orpet first reported (HERBERTIA 10: 124-126. 1943) that a portion of the seed obtained from these hybrids was devoid of the usual rose colored pigmentation. Experiments established the fact that such "alba" seed produced pigment free seedlings. Since it was already known that the seeds of the white flowered clones were pigment free, a means was available to isolate white flowering plants without going to the trouble of growing excess colored (pigmented) seedlings. Mr. Orpet and the writer have resorted for years to seed sorting to isolate the white flowering stock. With the exception of a few colored seedlings derived from the *B.* x *multiflora* 'Hathor' this sorting process has been an efficient means of differentiating between dominant colored and recessive white seedling phenotypes.

If we follow standard practice and use the letter *R* to designate a dominant red pigmentation in the albuminous flesh to the seed, and *r* to denote the absence of such pigmentation, we can then set up three possible combinations governing the coloring of flowers in the *B* x *multiflora* group, namely:

RR, A red genotype.

Rr, A red phenotype, capable of producing theoretically a yield of 25% white plants when selfed, or 50% white when crossed with the following *rr* genotype.

rr, A white genotype, being pigment free.

The typical *B.* x *multiflora alba,* which displays the most *Eubrunsvigia* characteristics of all the hybrids obviously is of the *rr* composition, and with reservations the same applies to the hybrid 'Hathor'. *B.* x *multiflora pallida* and *B.* x *multiflora rosea* are of the *Rr* composition, but one runs into difficulties selecting a typical *RR* hybrid since such clones contain sufficient *Brunsvigia rosea* genes to mask most of the *Eubrunsvigia* features. One of the major difficulties in working with these plants is to be able to recognize a hybrid when the hybrid features are completely masked by *B. rosea.* This masking not only applies to the possible *RR* type of *B.* x *multiflora hybrids,* but makes it practically impossible to distinguish *B.* x *parkeri* from a colorful *B. rosea.* There are no clear cut *Eubrunsvigia* features in the 'Lady Parker' hybrid.

Pigmentation is not the only noticeable factor appearing amongst the seed. The seed shapes and sizes are modified considerably by the albuminous content. This varies widely with different parentages, and to some extent smaller seed, particularly if spherical in shape, denote *Eubrunsvigia* characteristics. The most interesting example is the small spotted seed obtained from the hybrid 'Hathor'. By using either *RR* or *rr* pollen types we know from pigmentation, or respectively lack of pigmentation, that we have sexual seed. However, irrespective of the parentage, which includes selfing, the general magnitude of spotting remains unaltered. The condition is strictly a maternal epidermal factor and only appears in those seeds having little or no albumen. With the one exception of *B. rosea* var. *pallida,* the condition is not transmitted by pollen to other clones.

Attention is called to the very limited number of *B.* x *multiflora* types which appeared in Australia between the years 1860 and 1911 (when 'Hathor' was introduced). If we were dealing with a simple hybrid there should be a wide range of segregates, but variants amongst the *B.* x *multiflora alba* seedlings are practically nil. The white recessives from those with an *Rr* composition disclose slightly more diversification, but the actual *breaks* in flower shape and size are obtained from 'Hathor'. Such fixed features amongst the "*alba*" hybrids indicates rather definitely that *B.* x *multiflora alba* is a homozygous structural hybrid.

The breeding pattern of both *B.* x *multiflora rosea* and 'Hathor' indicates the presence of the structural entity of *B.* x *multiflora alba* in many of the resulting alba seedlings. *B.* x *multiflora alba* x *B. rosea* seedlings when selfed yield less than 1% alba seed. This F-2 alba generation is quite distinct from the typical *B.* x *multiflora alba* type.

The writer has used *B.* x *parkeri* in a number of crosses. Neither selfing, nor crossing with *B. rosea major* have given any outstanding seedlings. Those with *B. rosea* var. *pallida (minor)* have been quite distinct in foliage and floral shape, but the interesting results have appeared in those few crosses that took with the *B.* x *multiflora* group. The Parker hybrid is of Australian origin and may be from J. C. Bidwell's stock, but the breeding patterns of the *B.* x *multiflora* and *B.* x *parkeri* are quite distinct. One does not obtain *Eubrunsvigia* throwbacks when selfing *B.* x *parkeri,* and in crossing with the *B.* x *multiflora* one runs into a number of unpredictable seed types and lethal combinations. The seedlings from these combinations result in exceptionally broad petal *B. rosea* types, or as a distinct contrast, a colorful eight flowered *Eubrunsvigia* throwback which defies correlation to *B. josephinae.* For diversity of form, and for intensity of colors which includes the copper bronzes, this last hybrid group gives promise of something distinctly new in breeding *Brunsvigia.*

BREEDING PATTERNS OF **Brunsvigia** x **multiflora** CLONES

The following tabulation is a summary of observations made since 1942 covering hybridization with the *B.* x *multiflora* group. Only those clones in general circulation are listed. Details on seed pigmentation and size are indicated in key crosses. Reference is made to the accompanying plates nos. 5, 6 & 7.

1. *B.* x *multiflora alba* seed parent *(rr.* composition):

(a) Selfing produces medium sized angular seed, all pigment free (see Plate 5, right). Seedling plants have been similar to the parent.

(b) Pollinated with colored *B. rosea* varieties: A few colored hybrid seed developed plus 80-90% alba seed which appears to be from parthenogenetic sources. The colored seed yielded intermediate hybrids whereas alba gave typical *B.* x *m. alba.*

(c) Pollinated by 'Hathor': All seed pigment free. No spotting factor noted. Occasional clones obtained having blossoms with wider tepalsegs.

(d) Pollinated by *Crinum moorei:* Occasional *xCrinodonna seed* produced but very difficult to raise.

2. *B.* x *multiflora rosea* seed parent *(Rr* composition):

(a) Selfing gives a fair yield of mixed white, pale pink and rose seed. A 1:2:1 ratio is anticipated but incompatabilities invariably modify the ratio to less than 21% alba seed. No outstanding mature plants obtained, either colored or white.

(b) Pollinated by *B.* x *multiflora alba:* Out of 375 seed 51.3% were rose, the remainder white (See Plate 5, left).

(c) Pollinated by *B. rosea* forms: All seed colored (see plate 6, left). Seedlings often richly colored. Compare with *Brunsvigia rosea,* (Lam.) Hann. selfed, Plate 6, right.

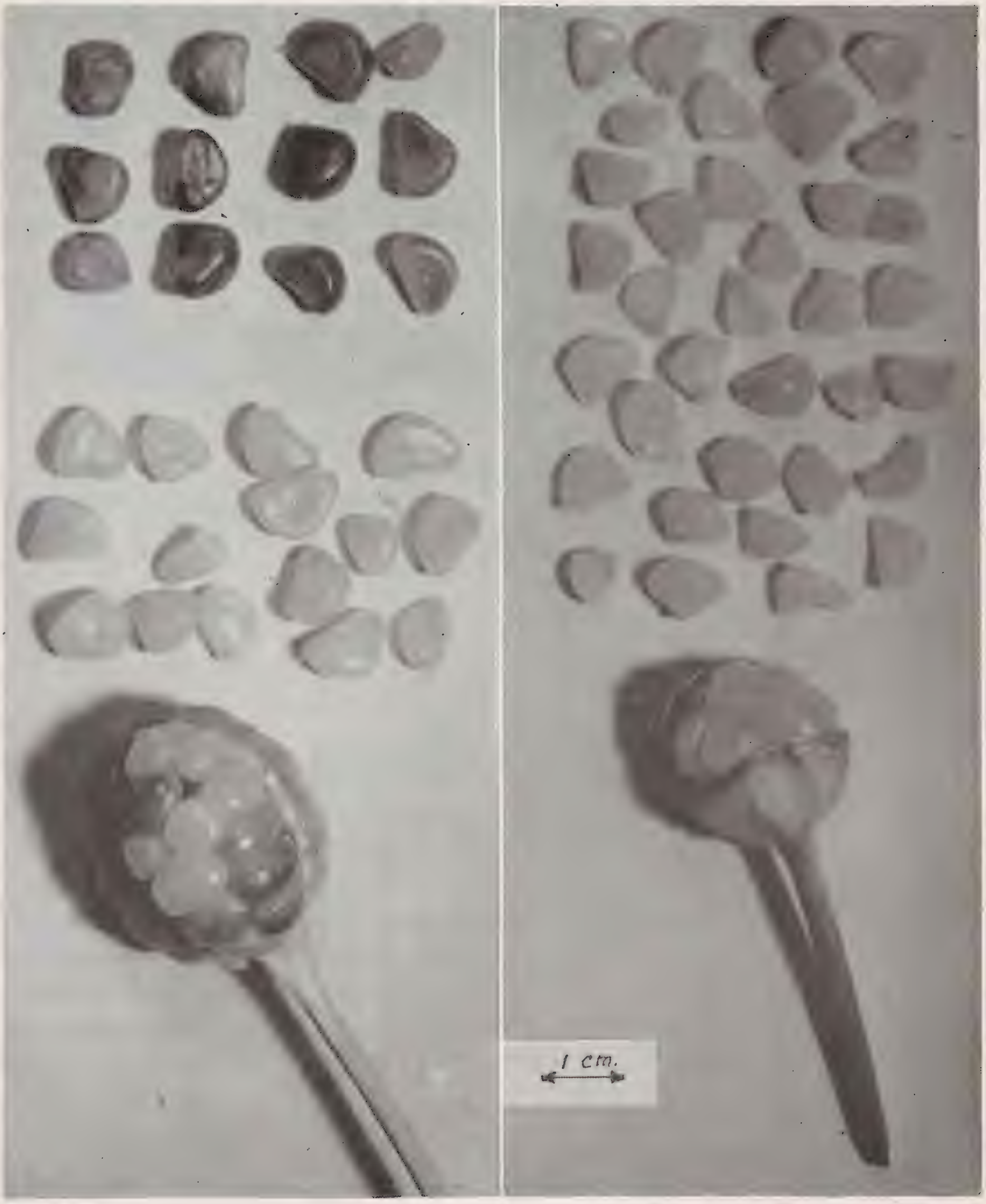
(d) Pollinated by 'Hathor': out of 694 seed, 305 red, 38 very pale pink, 341 white seed.

3. *B.* x *multiflora* 'Hathor' as seed parent *(rr* composition):

(a) Selfs with considerable difficulty unless temperature and humidity are favorable. Fine rust spots tend to pigment surface on all smaller seed. (See Plate 7, left) The following ratios were obtained:

Year:	*1945:*	*1948:*	*1953:*
Large white seed, unspotted	16	79	55
Medium white, some rust spots	34	93	57
Small spherical seed, well spotted	16	75	12
(b) Pollinated by *B.* x *parkeri:*			
Large albuminous unspotted seed	10 dk. rose	0	0
Large albuminous lightly spotted	40 dk. rose	24 lt. r.	2 alba
Medium well spotted seed*	23 dk. rose	46 lt. r.	7 alba
Small, heavily spotted seed**	0	0	38 alba

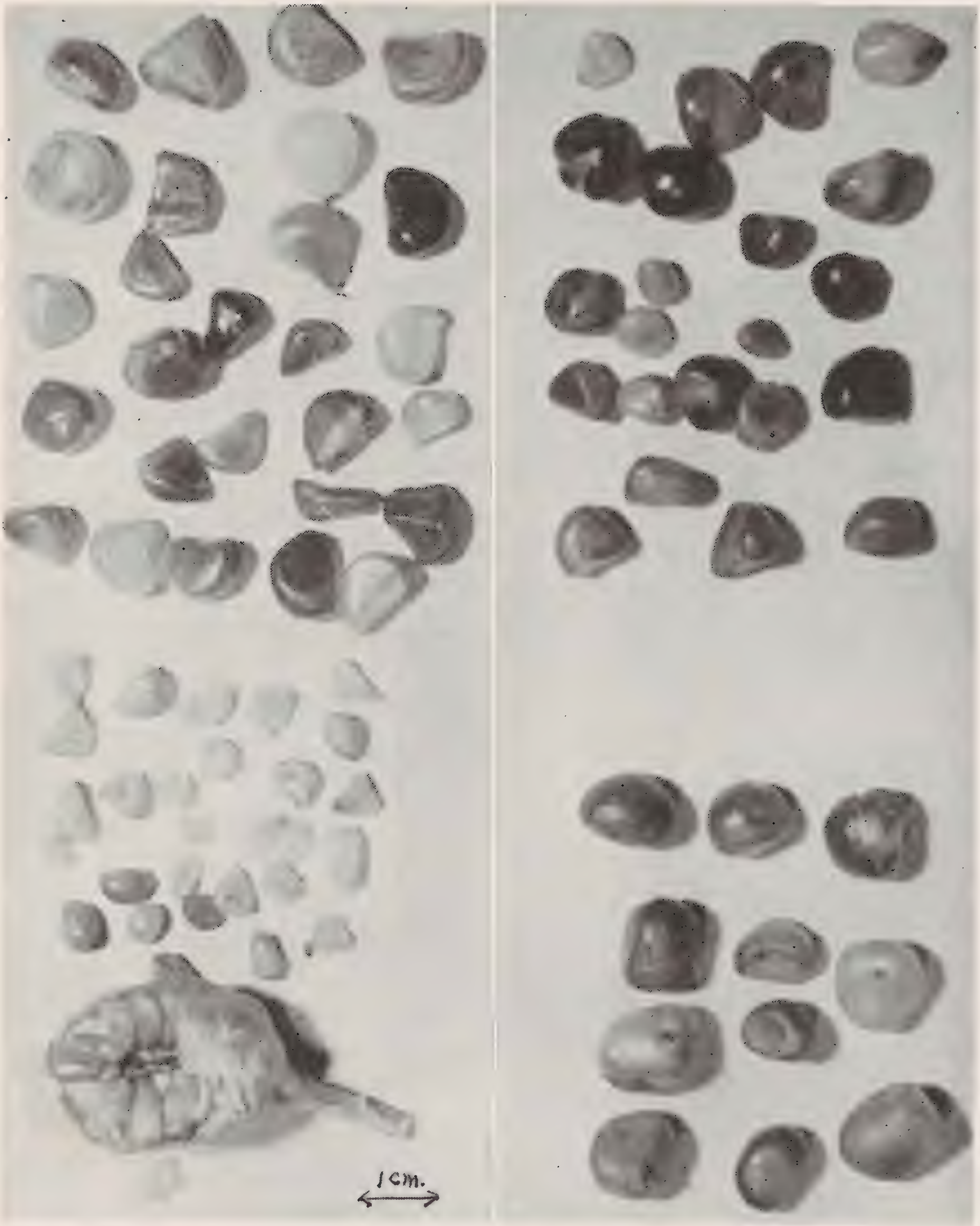
(* Source of 'Sunset' hybrids,
** Probably parthenogenetic)



Seeds of **Brunsvigia** hybrids: (left), **Brunsvigia** x **multiflora rosea** pollinated by **B. multiflora alba,** showing a 12 to 15, or 1;1 ratio of red (Rr genotype) and white (rr genotype) seeds;

(right), **Brunsvigia** x **multiflora alba** selfed, showing all recessive white (rr genotype) seeds. Note scale.

Plate 5



Brunsvigia seeds: (left), **Brunsvigia** x **multiflora rosea** clone (composition Rr) pollinated by **Brunsvigia rosea** (Lam.) Hann. The small seeds are without pigment, and these may be of parthenogenetic origin. In many cases the **Brunsvigia** x **multiflora alba** clones show lowered fertility; here this factor probably contributed to formation of small seeds;

(right), examples showing typical seeds of **Brunsvigia rosea** var. **major** at bottom; and **Brunsvigia rosea** var. **bicolor,** above. Note scale.
Plate 6

(c) Pollinated by *B. rosea* clone 'Frank Leach' (see Plate 7, right):

Year:	1948:	1953:
Large rose colored albuminous seed	70	
Medium sized light rose seed, some spotting	84	
Small spherical seed, heavily spotted, clear	68	

The first two types threw light pale pink blossoms, 8% were selected as outstanding. The small seeds in most instances damp off. Lack of pigmentation suggests parthenogenesis.

(d) Pollinated by *B.* x *multiflora alba* (A difficult cross):

Large or medium clear white unspotted seed	25	25
Large or medium clear white, partly spotted seed		65
Medium white, angular, heavily spotted seed		32
Small white, spherical, heavily spotted seed*		31

(* Probably parthenogenetic.)

(e) Pollinated by *B.* x *multiflora rosea:* This cross gave high seed yields. No seed counts were made. Both colored and alba seed were obtained with spotting evident in either.

4. *B.* x *parkeri* as seed parent:

(a) Pollinated by 'Hathor'. This cross produced a 70% yield of relative small angular seed that were only lightly pigmented. At the time the seed crop was assumed to be parthenogenetic and only a portion was grown. Numerous seedlings with broad tepalsegs were obtained. but were not as striking as the reverse cross. These small seed are not uncommon to other recently developed Australian hybrids, such as 'Glory'.

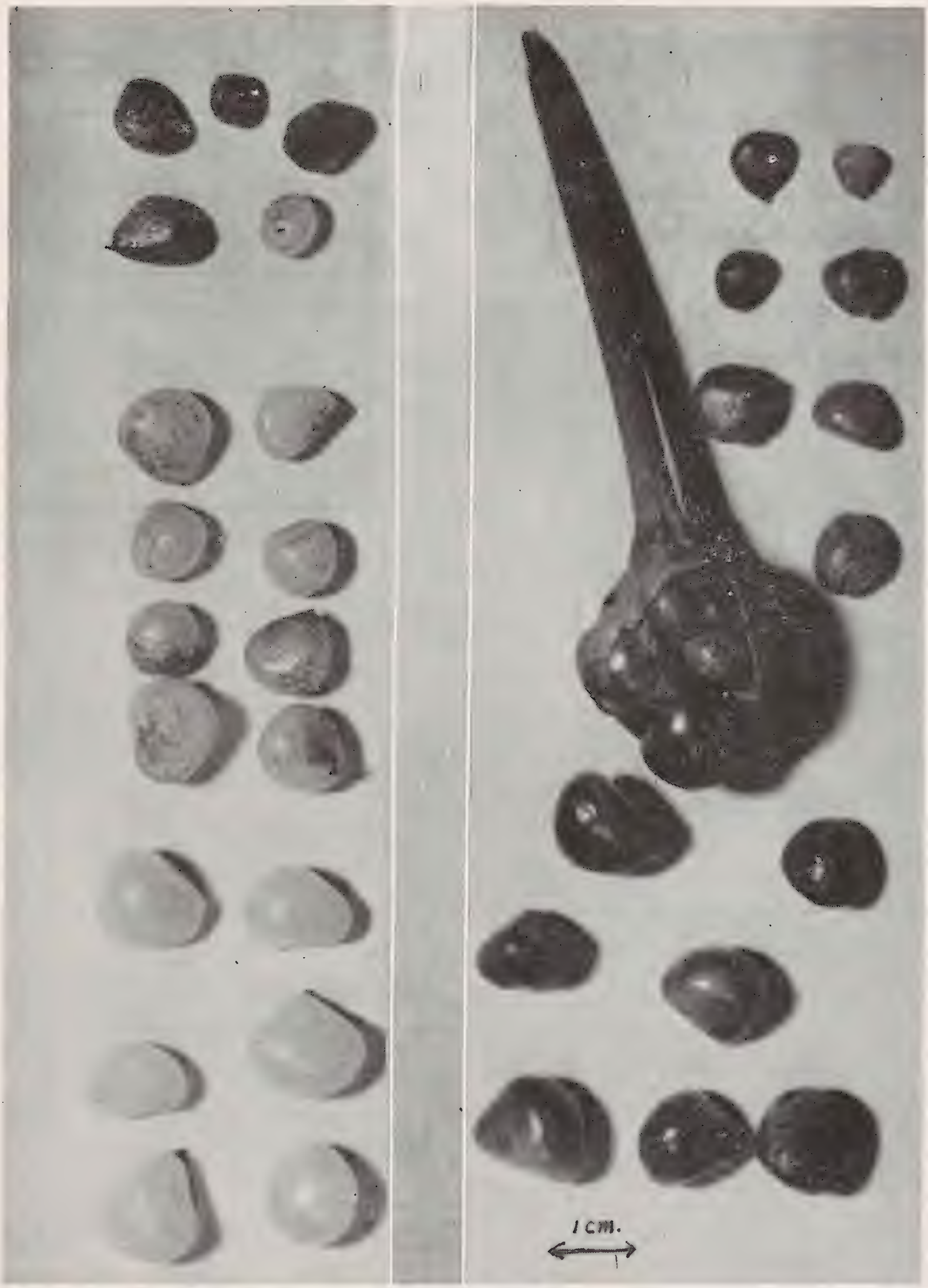
(b) Pollinated by *B. rosea* var. *pallida:* This cross gave an excellent yield of large seed. Narrow foliage of the pollen parent dominant. Plants flower with unusual variable color characteristics ranging from near white to wine red depending upon temperature conditions at time of flowering.

5. *B. rosea* var. *pallida* (syn. *minor):* This homozygous variant. which is quite small, often produces large flowered hybrids with the above described clones. The 'Hathor' spotting factor has been noted when 'Hathor' pollen is used.

6. *B. rosea* 'Frank Leach': This is an intraspecific hybrid of unknown source previous to 1890. The "picotee" pattern carried in the pollen phase has shown up in a number of *B.* x *multiflora* and *B. rosea* crosses. Female gametes apparently fail to pass on the "picotee" pattern.

Conclusions

Pigmentation of the *Brunsvigia* x *multiflora* seed is a dominant factor. Non pigmentation is recessive. The presence or absence of pigmentation in the seed is a means of segregating phenotype plants before germination, since seedling plants conform to the seed patterns. The



Seeds of **Brunsvigia** hybrids: (left), **Brunsvigia** x **multiflora** clone 'Hathor' selfed. Note six large clear white seeds at bottom, and above these, the increase in spotting intensity;

(right), **Brunsvigia** x **multiflora** clone 'Hathor' pollinated by a red parent clone of same hybrid type. Note seven clear rose (Rr genotype) seeds at bottom; and above these, seven spotted seeds, which may have originated from maternal tissue.

Plate 7

color patterns comply in the main to Mendelian laws, but minor deviations occur due to lethal factors, parthenogenesis, and other incompatabilities. The spotting factor associated with the small seed from the hybrid 'Hathor' does not follow the Mendelian ratios, being strictly associated with seed size. Being entirely an epidermal condition it is undoubtedly derived from a maternal source.

B. x *multiflora alba* exhibits a breeding pattern that indicates that this plant is a homozygous structural hybrid. The *B.* x *multiflora* group backcrosses readily with *B. rosea* but intercrossing with *B.* x *parkeri* often results in irregular seed yields due to incompatabilities. Of all the hybrid types flowered the *B.* x *multiflora* crossed by *B.* x *parkeri* yielded the greatest diversity in the seedlings, particularly when 'Hathor' blood was present. From the seed patterns and from the seedlings flowered it is evident that the dominant features of *B. rosea* are sufficiently disrupted to exhibit numerous recessive *Eubrunsvigia* factors. Until more *Eubrunsvigia* type seedlings flower within the next year or two a final decision should be withheld, but it appears that *B.* x *parkeri* and *B.* x *multiflora* have different *Eubrunsvigia* parentages. This concurs with a view held by G. K. Cowlisham, who in the 1935 Herbertia suggested that *B. grandiflora* Lindl. was the missing parent.

MULTIPLE SCAPES ON HEMEROCALLIS

Philip G. Corliss, M.D.,
S. W. Reg. Vice-Pres., Somerton, Arizona

Although double scapes (stems) on single crowns of daylilies are not uncommon, and triple scapes have been seen by many growers, I was unable to find any hemerocallarians at the 1954 meetings and garden tours who had seen a quadruple scape.

Because of this, I offer these two photographs which show such growth on a well-established clump of the evergreen (and nearly everblooming) variety 'Babette' (Hayward). Fig. 18.

There is nothing particularly attractive or desirable about the multiple scapes; they are ram-rod stiff, have too many crowded flowers followed by too many stumps and pods. The multiple stalks, like the flowers with extra segments, are often found on certain varieties which show this tendency. The factors disposing to the phenomena are: (1) variety known to show this characteristic; (2) well-established clump; (3) optimum water, plant food, and other growing conditions, such as temperature, drainage, etc.

The first photograph [Fig. 18] shows several scapes of 'Babette' with a triple scape at left and the quadruple scape to right of center. There are two double scapes and two single scapes between these two.

The second photograph [Fig. 18] is a closeup of the seed pods on the quadruple stalk. The pollen parent was 'Alnilam' (Saxton) an excellent bicolor of early and remontant bloom habit.

NARCISSUS BREEDING PROJECT, 1954

Dr. J. S. Cooley, *Maryland*

Again the narcissus group of plants have been a source of great pleasure and satisfaction. My seedling beds have continued to be interesting and beautiful. The planting of seedlings having a predominance of light colors was particularly pleasing. Many of the plants in this lot were outstanding in the blending of soft colors. They also showed a wide variety of form and growth habit. The possibilities are so great of getting interesting and beautiful flowers from a bed of seedling narcissus that it seems strange that more people do not choose as a hobby the breeding of this remarkable genus of plants.

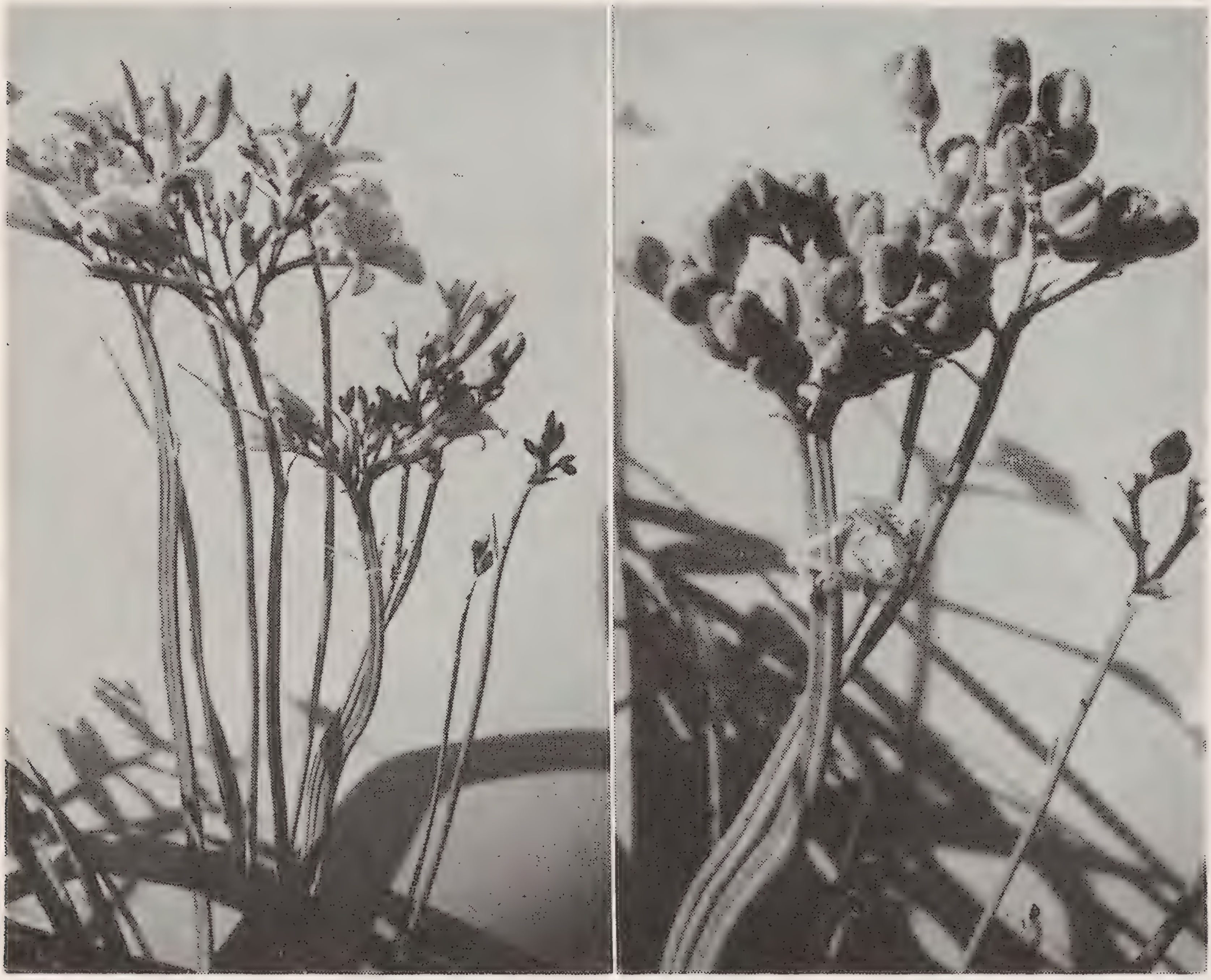


Fig. 18. Multiple scapes (faciation) in *Hemerocallis* clone 'Babette'. Photo by Dr. Philip G. Corliss.

The breeding of new varieties that are tolerant of one's local conditions of soil and climate is surely a worthwhile project. The outcome of such breeding work that is being carried out in many parts of this country as well as in other parts of the world in such a diversity of soil and climate will undoubtedly greatly promote and popularize this genus of plants.

It has been interesting to me to see how many of our visitors express a fondness for the jonquils and the jonquilla hybrids. Breeding work in this group is probably one of the avenues the breeder might follow with profit. There are many possibilities in this field that might well be promoted: quality of flower, color, time of blooming, and ability to persist.

One of the projects of the narcissus fancier is the quest for varieties that will thrive in his particular climatic and soil conditions. For some time I have been hunting for a long trumpet golden colored narcissus that will tolerate our conditions and be useful both for the home garden and also for supplying the florist trade. I have tried a considerable number of varieties, and, up to the present time, all things considered, 'Dawson City' has been by far the most satisfactory. Many of those I have tried are apparently good under some conditions, but for our conditions they have been very unsatisfactory. 'Golden Harvest' is an example of such a variety.

A group of plants that thrives in such a diversity of soil and climate as the narcissus surely should be used and enjoyed by more people. More and more people are becoming members of garden clubs and apparently more people are becoming flower conscious. These things will probably ultimately make for a greater appreciation and use of narcissus.

HYBRIDIZATION OF HYMENOCALLIS

Len Woelfle, *Chairman,*
Pancratieae Committee

For those who might care to turn their creative abilities to the improvement of this genus let it be understood at the outset that here lies a challenge to all the ingenuity you may be able to muster, but also be assured that almost any new cross will give something of merit. Hybrids with the Ismene group as seed parents are not easy to come by. There will be few seeds from many pollenations unless you can develop a technique so far undetermined. Many of the evergreen types set fertile seed and perhaps future development lies in that direction. The hardy species might also be brought to bear to give offspring which might be used as permanent garden plants, not requiring the fall digging and winter storage.

Yes, indeed, this is a fertile field for improvement. So far as I have been able to determine there are at present only five proven hybrids and one of doubtful parentage available in the trade.

Hymenocallis x 'Advance'— *(H. narcissiflora* x *H.* x 'Festalis').
H. x 'Festalis'—*(H. narcissiflora* x *H. longipetala).*
H. x 'Olympia'—(supposedly *H.* x 'Sulphur Queen' x *H. narcisssiflora).*
H. x 'Daphne'—*(H. narcissiflora* x *H. speciosa).*
H. x 'Sulphur Queen'—*(H. narcissiflora* x *H. amancaes).*
H. x *macrostephana* (supposedly *H. narcissiflora* x *H. speciosa).*

Although the genus as a whole, has many fertile species, and most will thrive with cultivation, many do not readily set seed. To date I have enjoyed moderate success with hybridizing in the group. All seedlings are as yet unnamed and none are ready for distribution.

Seedlings of one species *H. harrisiana* often show hybrid characters when immature, but turn out to be parthenogenetic seedlings. Several of my later attempts hold promise of being true hybrids, but true proof is in the bloom character and these have not yet bloomed. To date the following attempts may be listed:

#5001—*H. amancaes* (seed) x *H. longipetala* (pollen).
#5002—*H. amancaes* (seed) x *H. narcissiflora* (pollen). (reciprocal to 'Sulphur Queen' cross).
#5003—*H. narcissiflora* (seed) x *H. amancaes* (pollen). (duplicates the 'Sulphur Queen' cross).
#5004—*H. harrisiana* x *H.* x *'Festalis'*.
#5008—*H. harrisiana* (seed) x *H.* unknown (pollen).
#5101—*H. harrisiana* (seed) x *H. amancaes* (pollen).
#5102—*H. harrisiana* (seed) x *H. narcissiflora* (pollen).
#5103—*H. harrisiana* (seed) x *H. longipetala* (pollen).
#5105-A—*H. narcissiflora* (seed) x *H. harrisiana* (pollen).
#5105-B—*H. narcissiflora* (seed) x *H. harrisiana* (pollen).
#5106—*H. narcissiflora* (seed) x *H. longipetala* (pollen). (duplicates the 'Festalis' cross).
#5208—*H. narcissiflora* (seed) x *H. amancaes* (pollen).

Of the crosses mentioned above, numbers 5001, 5002, 5003 and 5106 have all bloomed and hybridity is proven. All others should bloom in 1955. The crosses #5105-A and #5105-B were two separate pollenations, and show enough variation between the seedlings to list separately.

Germination of *Hymenocallis* seed varies little from one species to another. The seeds are merely anchored (not covered), and kept moist and lightly shaded until germination is completed (evidenced by decay or shrinkage of the seed).

Seedlings of the Ismene-Elisena group, the deciduous species from Texas, *H. harrisiana* and possibly some of the other Mexican species must be dried off after the germination is completed and left to rest in this dry condition until spring when water may be given to produce foliage. They should be kept in active growth as long as possible the first year to produce the largest possible bulbs. If left in the pots over winter the young bulbs will get off to a much quicker start the following spring when they may be removed from the pots and plunged into the garden with the ball of soil intact. After a full summer's growth in the open soil of the garden, most should bloom the following spring.

Seedlings of the evergreen types may or may not require a rest period after germination. If foliage is produced after germination they should be kept in growth, but some are intermediate in their habits between the Ismene group and the evergreen group and might require the rest period before starting active growth in spring.

Obviously the seed of the hardy types should be handled so they may be disturbed as little as possible. They would probably require moisture over winter, and the best way to handle these might be to plant and leave them right with the mother plant. If crossed with the tender or Ismene-Elisena group, some intermediate treatment would seem in order.

Flowers are The Maker's most beautiful gift to the world, and if we can leave just one good new plant creation to posterity, we shall not have lived in vain. If success in this pursuit is not meant to be, we shall be the better for having tried.

DAYLILY NOTES, 1954

W. D. Ballard, *Maryland*

The 1954 season here for daylilies has been very dry and hot. Such conditions pose difficult problems for daylily breeders, especially in the evaluation of new seedlings. One has a feeling that they are not showing their true characteristics and one is afraid to discard as rigorously as should be done under more normal conditions. On the other hand there is some satisfaction in knowing that anything showing up well under unfavorable conditions is likely to be even better when conditions approach normal.

Nature, fortunately, has provided the daylily with unusual powers of survival under conditions of scant moisture—their fleshy storage roots act much like bulbs in this respect. With the return of moist conditions their ability to recuperate is quite remarkable. Generally the most satisfactory method of germinating daylily seed is to plant them out of doors in late fall or early winter. Usually they come up very well the following spring. Their growth from then on depends in a large measure on soil conditions and the presence of ample supplies of moisture. With dry summer conditions one is often disappointed at the lack of growth made. However, when such seedlings are dug up for transplanting, it becomes evident that the lack of vegetative growth has been to a large extent compensated for by the excellent development of storage roots.

Many daylilies set seed freely under natural conditions and unless seed pods are removed before the seeds shatter the volunteer seedlings soon become a pest. This is particularly true in nursery blocks where it is so essential to keep named varieties free from rogues.

On the other hand some daylilies do not set seed unless artificially pollinated and a few—such as 'Europa'—are notably sterile. 'Ruby Supreme' has often been pointed out as a variety which seldom sets seed. One would naturally expect some difficulty in crossing ordinary varieties with the new tetraploids. However, seedlings have been secured from crosses of two un-named sorts with 'Brilliant Glow'. Two tetraploids would probably cross more readily but so far few varieties of this type are available to the average grower. This new type should open up an interesting field for the hybridizer but it will take a few years to determine how much promise there is in this new direction.

It has always been difficult for the hybridizer to know what progress is being made by other workers in all sections of a country as large as this. Without this knowledge he may hesitate to put a new variety on the market. However, there is one side to the question which should not be overlooked. Because a variety is outstanding in one section, it does not necessarily follow that it will succeed equally well in all other areas. It is undoubtedly true that many varieties developed in regions of abundant moisture and moderate temperatures would not stand up in the hot sun and high temperatures of the mid-west and south. It might simplify matters for the hybridizer to forget about developing daylilies adapted to all sections of this big country and concentrate on producing suitable varieties for his own particular region. If his originations should then prove adaptable to some other sections, so much the better. His aim, however, could be narrowed down to the region with which he is most familiar.

[PLANT LIFE LIBRARY, continued from page 63.]

regulators, vitamins, micro-nutrients, enzymes, and soil-water-mineral-nutrition relationships. Chapters 1 to 9, are concerned with general considerations, morphology and physiology; Chapter 10 to genetics: Chapter 11 to evolution; Chapters 12 to 21 to taxonomy; and chapters 22 to 23, to ecology. This stimulating text is highly recommended.

THE MICROTOMIST'S FORMULARY AND GUIDE, by Peter Gray. Blakiston Co., 575 Madison Av., New York. 1954. pp. 794. Illus. $10.50.

This detailed new book consists of two parts, (1) the first 16 chapters are a treatise on the art of making microscope slides from biological specimens, and (2) chapters 17 to 28 are devoted to a detailed classified list of the formulas and techniques used in this art. A list of abbreviations used, books and journals cited, and an index complete the book. This mine of information is indispensable to all who are concerned with the marking of microscope slides.

ECONOMIC GEOGRAPHY, by C. F. Jones and G. G. Darkenwald. Rev. ed. Macmillan Co., 60 5th Av., New York. 1954. pp. 612. Illus. $6.75.

In revising the text, the authors "have taken into account the many effects of war and reconstruction, evolving political affairs, new discoveries, and technological advances." As in the first edition, the subject matter is organized "by types of activities or industries: hunting, fishing, gathering of forest products and lumbering, grazing, farming, mining, manufacturing, transportation and trade." This excellent, easily readable text is highly recommended.

MANUAL OF THE PLANTS OF COLORADO, by H. D. Harrington. Alan Swallow, 2679 So. York St., Denver, Colo. 1954. pp. 666. $8.00.

This is the only complete flora of Colorado now available. It includes keys for the identification, and complete descriptions of, the 117 families, 693 genera, 2,794 species, 263 varieties and 88 subspecies recognized.

[PLANT LIFE LIBRARY, continued on page 112.]

4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

EXPERIENCES IN GROWING HYBRID AMARYLLIS

NICHOLAS T. URHAUSEN, *Illinois*

By way of introduction I must admit that I grow my Amaryllis simply as a hobby; I have been growing them for about thirteen years now, having started with the cheapest and I am now growing some of the finest from Holland. They are all grown in a greenhouse.

I'll begin with pollinating the flowers. I never use any brushes, but simply remove the stamen and anther and fertilize the pistil when it has opened.

About four weeks later the seed is ripe (in April and May), and I sow it immediately on one-inch squares in a mixture of two-thirds good garden soil and one-third granulated peat; then it is watered well. The temperature is kept between sixty-five and ninety degrees Fahrenheit—the temperature gets this high on sunny days. The flats are covered with a pane of glass and kept in the shade, and they require no more water until the seed is well germinated; then the glass is removed. About three weeks after sowing the roots emerge from the seed, and a week later the leaf sprouts can be seen.

I water them only when there is good air circulation, thus avoiding damping off. Since the original mixture was rich, and the peat helps to retain moisture well, the seedlings can remain in these flats till the following December. Then they will begin to grow rapidly with the coming longer days.

In December then they are transplanted into benches filled to six inches with a mixture of about three-fourths good garden soil (mixed with some superphosphate and bone meal) and one-fourth rotted manure and sphagnum moss. The moss keeps the soil loose and it seems the roots develop many side rootlets into it. With a temperature no lower than sixty and anywhere up to one hundred degrees Fahrenheit many should bloom in another year. During the growing period adequate moisture and heat are much more important than the type of fertilizer used; they love a humid, though not stagnant, atmosphere created by a wetting of the foliage on sunny days and *a shading on the glass during the hot summer.*

My discussion of the flowering bulbs will begin at the stage when they are through blooming. I cut off the scapes at the base of the bulb when no seed is desired, usually the leaves are already growing nicely.

The first flush of leaves comes before, with, or after the flower scape; I like to have mine bloom in late January to early February so that they have a long season ahead to grow. The first leaves come in February, from four to seven; in early June some send up more leaves; in mid August they all send up another flush of leaves. It is very important to give sufficient water at these growing periods which last for about three weeks in February, and two weeks in June and August due to longer growing days. Long and strong healthy foliage is so important to the Amaryllis because it in turn rejuvenates the bulb. If I happen to break a leaf or damage one without completely severing it I simply leave it alone; usually it knits and keeps on being active. I never cut off any green leaves; when the bulb doesn't need them they turn yellow by themselves and can be removed.

So often people notice red dots, streaks and what have you on the upper or lower parts of the leaves; I have the strongest conviction that this comes from too much sun. In the greenhouse I have about fifty pots partially shaded, and there are red marks here and there on those most exposed to the sun; in another section I have thirty in complete shade until noon and partially thereafter; there is not a single red mark or scratch on any of the leaves of these thirty pots.

Towards fall I keep right on watering my Amaryllis as they use it; naturally it is less than the summer amounts, but they still are watered and kept moist until January when they begin sending up their new scapes; if their leaves are still green I leave them on, but they usually turn yellow as the new growth appears. During December I scratch some bone meal or superphosphate in the top of the soil so it will begin breaking down when the leaf growth begins in late January and February.

Often with a bulb growing the second year I wonder if I should repot the bulb. In late December I simply knock the bulb with the soil out of the pot, and, if I see a good network of roots all around the outside of the ball of soil, I return it to the pot for another year; if the bulb seems loose with no or few roots I repot it in new soil. I think a bulb should be able to grow in the same pot for at least two years, as long as the soil stays loose, of course often it becomes very hard as much of the humus has been used up. I do my repotting in December.

When new bulbs arrive I pot them up immediately, leaving whatever roots there are on the bulb. I like to keep them as warm as possible (fifty-five to seventy degrees Fahrenheit) to induce root growth; although they often seem to send up scapes in a warm temperature at the expense of the bulb, still it is much easier to induce root action, than leaving them in a cool temperature (forty to fifty degrees Fahrenheit) where no growth or root action takes place. Sometimes it seems bottom heat helps new roots to grow. Certainly bulbs will not rot as easily under warm conditions as they do in cool. Scapes have no bearing on roots starting, but leaves do, if the leaves begin growing actively you can be sure new roots are forming and growing. This leaf growth never hinders the flowering ability; I think it improves it.

In my potting mixture I add bone meal, superphosphate, rotted manure, sphagnum moss, and sand to keep the soil loose. Soils that pack hard cause many new bulbs to fail to grow, and to die. After the bulbs are through blooming, such a soil is packed so hard that the roots find it very difficult to penetrate the soil.

The pots I use are always seven- or eight-inch azalea pots; I would use even bigger ones but they get too heavy to handle; I see absolutely no advantage in using small pots. My best blooms come from bulbs growing in the open benches with their roots unrestricted. It does seem that the roots have a special affinity for wood, and I think rotted wood in the soil would suit them very well.

I never dry any of my bulbs, but naturally in their November and December resting period I apply very little water, just keeping them moist. Their rest is induced by the shorter darker days; dryness alone won't make them rest.

Whether to plunge the pot containing the bulb in Summer outside. or remove the bulb and soil and plant directly into the garden are difficult questions to answer. In a pot the plant dries out much quicker. If you remove the bulb from the pot you face the problem of taking the plant in, in the Fall, and the bulb is disturbed to the extent that the leaves all turn yellow a few days after the replanting. If kept in pots, they remain green well into the Winter.

REMINISCENCES OF A BULB GROWER

W. E. Rice, *California*

In the old days, that is some thirty or more years ago, I used to grow commercially, only for the big jobbers of the country, about sixty different kinds of bulbs, but as time went on it was deemed advisable to cut down especially during the depression, about 1930. Then when things began to get better, it was found we had a lot of new competition. It was found that we had to grow in larger quantities so as to ship in car load lots. We also found we had inquiries for Hybrid Amaryllis which we were not growing. We did have about six very choice bulbs in our own garden, so we started in with these six; saved the seeds and in doing so we found each individual flower gave us anywhere from 75 to 90 seeds.

By buying some outstanding varieties we soon had a pretty good planting, and the first thing we knew, we had better than 12 acres of them.

Of these we selected the very choicest stock to breed from. Soon we had so many of them, but we would not sell. One of our customers asked, ''when are you going to let us have some of your pets.'' It's funny about Amaryllis—you grow them for a living but yet you hate to part with them. We however, divided them up; keeping of course the very best for ourselves.

After a while the business grew so we could ship them East by the car load. Then it was that we decided to have some named clones. We started to propagate by cutting, rather tedious work when you are used to only field work. When one has 47 acres of bulbs, one has little time to experiment. When we cut up around 500 bulbs, we just had to take the time to take care of them. We were fairly successful at this and managed to get commercial quantities of pure white, pure red—both light Red and dark Red. We got one so dark we named it 'Zulu' and it went over big. Another, orange scarlet we named after the best half of our family 'Lady Helen'—of this one we never had enough. Another we called 'Java'; this one was purple or magenta with a pure white throat. Another we named 'W. N. Campbell', a large, very round bloom, white with bright scarlet blotches. We also had a few others, and found that to make any money in Amaryllis you must have named clones; then you never get into any trouble as the buyer gets exactly what he buys.

We also had a good lot of Nerines, one outstanding clone we named 'Pink Triumphant.' We still believe it is the most valuable Nerine yet produced. It can be brought into bloom about the 15th of December, and by the 15th of January they are through blooming. At this time flowers are not only scarce but in big demand. When we let loose of them, we sold the larger bulbs to Van Tubergen at Haarlem, and the rest we sold to Tom Craig here in California.

Well so much for bulbs. Los Angeles County grew so fast and we sold our acreage for subdivision and sold out all of our planting stock—

CONSIDER THE HYBRID AMARYLLIS

Robert G. Thornburgh, *California*

This is a flower that will nearly always appeal to a man who ordinarily does not concern himself with flower gardens or flowers. One made the comment on seeing a full Amaryllis bloom,—"Ordinarily I care nothing for flowers or gardening and my wife takes care of all that sort of thing but this is a flower that I could really go for." The women are attracted almost equally to them. Forced into bloom in a pot, however, they often present problems in home display without any leaves and an ugly pot to hide. There are many ways to get around this fault my own being to sink the pots in the planters that are around the house which ordinarily contain large philodendrons but still have enough space to accommodate the pots. Ordinary kitchen aluminum foil around the pot or other florist devices to dress up the pot can be used. The cut stems simplify this problem but make the problem of producing seeds more complicated. Cut stems, however, are readily brought to seed as described by Mr. E. Both in his excellent article on hybrid amaryllis appearing in the 1949 issue of Herbertia. Merely suspend the cut stem in a large necked bottle such as an ordinary milk bottle, and cover the space between stem and neck to retain the humidity within the bottle. An inch of water on the bottom is sufficient. Do not allow the stem to touch the water, otherwise the former will begin to rot. It, never-the-less, gets almost more than enough moisture to keep it going till seeds are mature. Often as not there is not even a "rust" formation on the stem unless it touches the water.

For one who is obtaining his first bulb of hybrid Amaryllis it is wise to obtain the largest possible size. These will as a rule bloom even if poorly handled. If potting is delayed and the bulb warmed a little it will begin to put out a stem even before it is potted. A small bulb may be a big disappointment in not blooming the first year. Here in

California it is possible to bring hybrid Amaryllis into bloom in 18 months from seed, and this is not difficult nor does it require skill. Such bulbs are usually quite small but will bloom by virtue of a well established root system. If the bulbs are transplanted some roots nearly always perish and the subsequent blooms may be set back a year or two. It is noteworthy that in growing hybrid Amaryllis from seed in sufficient quantity, it is possible to have blooms eleven months out of the year. The reason for this seems to be that seedlings do not feel obliged to bloom in the proper season the first time but they fall in line when older and bloom around Easter time as the older bulbs do. There is, of course, the exceptional older bulb that will get an atavistic urge and bloom in the middle of the coldest part of winter ignoring the dormancy of its companions. This will happen if you have enough of them around.

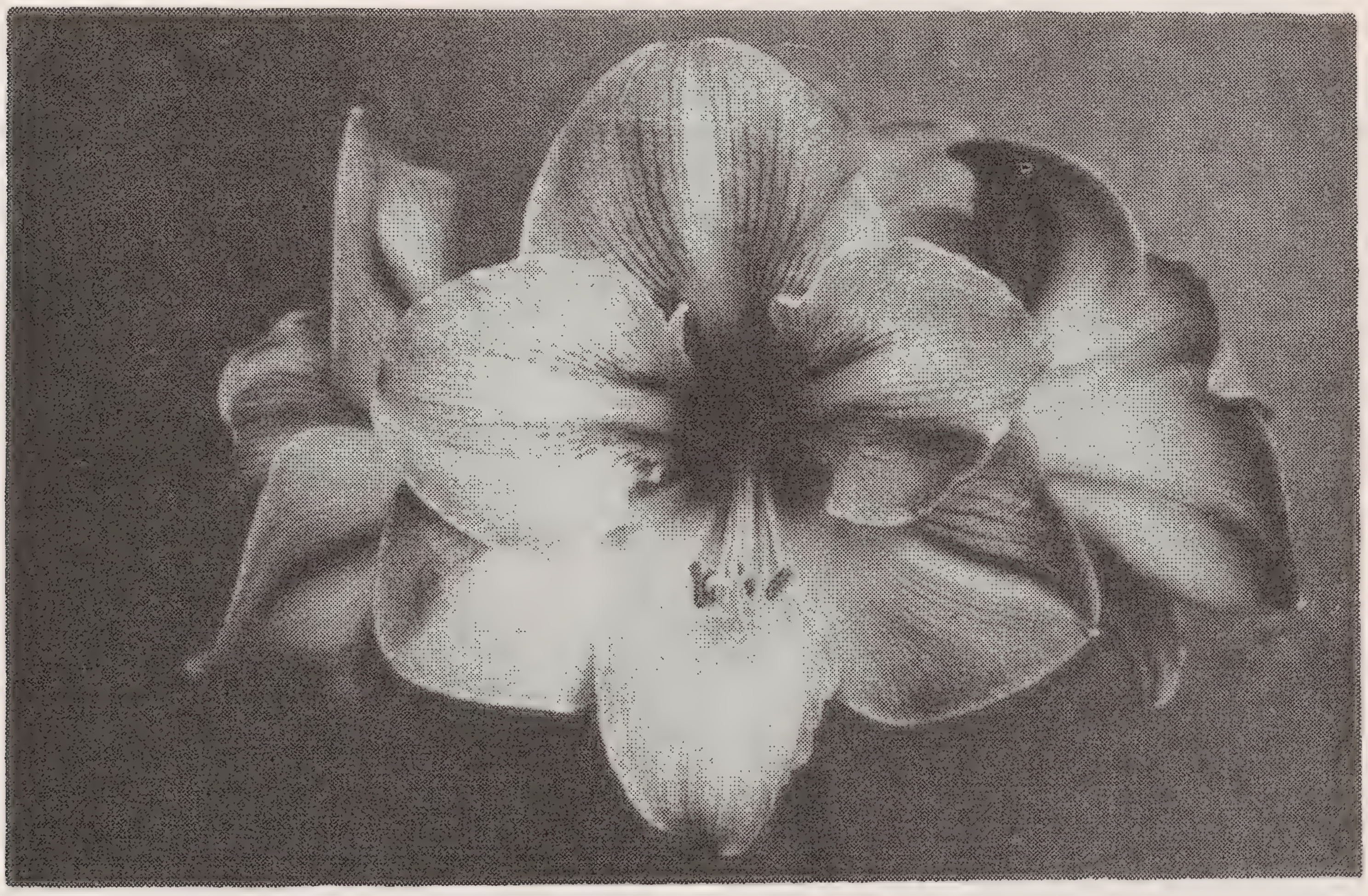


Fig. 19. Hybrid *Amaryllis* 'Apple Blossom'.

For several years I had accepted the dictum that Holland bulbs of the named varieties were suitable only for greenhouse culture, and that they were not hardy out of doors. This has not been my own experience. Here in California the Holland named varieties are hardy and their seedlings even more so. Experience with the Mead strain, which are so hardy in Florida, has shown that they are less hardy in California than the Holland strains. Howard & Smith's Nursery is an outstanding example of this since their extensive plantings are hardy in California extremes of heat, dryness and cold. Their strains are superior by virtue of the fact that they were crossed with the Holland varieties for many years, according to statements made by employees of that Nursery. It has always been a question in my own mind if the Dutch varieties might not even be as hardy in Florida in spite of previous reports to the contrary. It has come to me through a personal communication from an Amaryllis fan in Fernandina, Florida, that the Dutch named varieties are quite hardy in his area. When one considers that a bulb received from Holland is, as a rule, quite large and can be forced the first season and not uncommonly for two seasons, it is hardly a fair conclusion to arrive at in saying that these bulbs are not hardy out of the greenhouse. If given a good root system after they have recovered from forcing and seed production, they do well in the ground.

It is well to remember when purchasing named varieties that are advertised as clones that it is possible for the blooms on the self same bulb to vary somewhat from year to year in color, shade of color and in markings—not to mention that a self colored bloom without the slightest bit of green on it does not guarantee that all future blooms will lack a little adulterant green. After several years of comparisons and observations it is my firm conviction that reliable Dutch bulb growers are yearly and regularly producing and exporting clones.

In making an attempt to pass on personal experiences as to likes and dislikes it is hoped that the reader will not gain the impression that there is anything scientific connected with grading the quality of bulbs or blooms in this instance. The following notations as to personal impressions of named varieties cannot be compared with Thomas Manley's evaluations carried out under fairly uniform greenhouse conditions. They represent results that the amateur may obtain under reasonably good culture.

Purchase the bulbs and arrive at your own opinions.

WHITE

Of those brought to bloom in the early part of 1954 'Ludwig's Dazzler,' 'White Giant' and 'Marie Goretti' of Ludwigs strain were superior and all were marked Grade AA. 'White Giant' lived up to its name this time. 'Ludwig's Dazzler' was the clearest of whites with no green whatsoever present either posteriorly or anteriorly. 'Marie Goretti' was most graceful. On Christmas day a van Meeuwen's 'Albino' bloomed. This was graded A plus. It was of very flat face and nicely shaped with evenly matched segments. The green that showed in this flower gave it a most cool and beautiful appearance. Now that extremely pure whites are available, I'm beginning to appreciate how beautiful the addition of green can be to a white flower.

BICOLORS

'Candy Cane' (Ludwig's) Grade A. This is one of the most outstanding novelties in a varigated hybrid amaryllis introduced in some time. A flat faced Leopoldii type with wide segments. The color design is quite symmetrical and tasteful. The color was Mandarine Red (17/1 Royal Hort. Soc. Colour Chart) which predominated. The outstanding thing was the one-fourth inch white border that outlined each segment completely. Along the center of each segment from the throat outwards about two-thirds of its length was a similar white stripe of the same width. The appearance was of a light salmon but in spite of this it was bright. If placed by itself so as not to be outshown by a brilliant red, it was extremely outstanding and colorful.

Howard & Smith bicolor; temporarily dubbed 'Harvey' after the person it was obtained from whose father has a crinum that bears the name of 'Harvey.' This is almost precisely the same as Ludwig's 'Candy Cane' with the exception that the color is Currant Red (821/1) giving the appearance of an intensely dark maroon and as if laid on with a sticky oil paint that was still fresh. The segments on this one are so wide as to be almost circular individually giving the entire face of the flower same shape. Again the one-quarter inch white border; and a white stripe from throat to tip on the posterior segments only. On the anterior segments the same stripe of one-quarter inch white was broken before reaching either the tip or the throat. This was graded an AA since its color was better than 'Candy Cane' though the design on the face was otherwise nearly identical. Once in a while as you approach a field of hybrid amaryllis in full bloom from a distance one of the blooms will stand out over all the rest. This clone was that way when first seen. and when one approached closely to examine it one was not disappointed. In fact, at close range it was even more striking. Many of the Howard & Smith hybrids have this color and I have not encountered its exact shade in any of the importations.

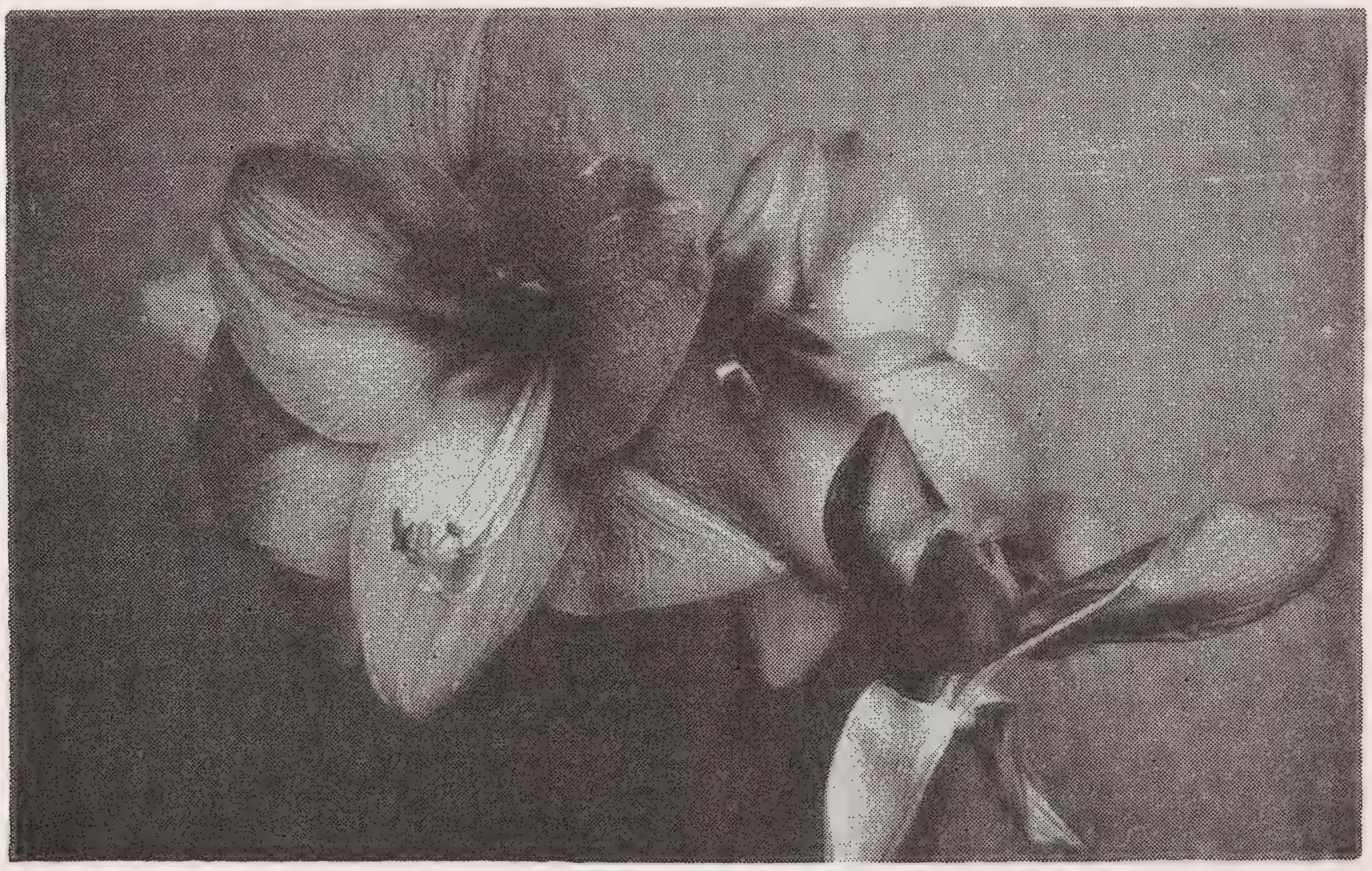


Fig. 20. Hybrid *Amaryllis* 'Fidelity'.

'King Of The Stripes' (Warmenhoven) Grade B. Between Shrimp Red 616 and 616/1 (RHS), white border and white center stripes on segments that run their full length. Very uniform. Remainder of segment surface had multiple shrimp red stripes so merging together as to give an impression of near solid color from a distance. Upper three segments more intensely colored than lower three. Minimal green in throat. Reminiscent of Mr. Wm. Rice's 'C. W. Cambell' though the color was not as brilliant. Actually the color was a little dull and what Houdyshell terms "brick" color resembling in a good many ways the Mead strain.

Howard & Smith bicolor (Resembles Mr. Rice's 'Java) Grade A. A one-inch border of Turkey Red (721/1) with a white center. Stamens white. Apple green deep in the throat is clean against the white rather than streaky or "dirty" in appearance. Tubular flower with wide posterior segments and anterior ones less wide. The older salesmen at Howard & Smith's nursery have stated that Mr. Fred Howard strove for large posterior segments and small anterior ones in his crosses and propagation for better form. This has been noticed as a characteristic of many of the amaryllis from that nursery.

PINKS

'Apple Blossom', Grade AA. (See Fig. 19.) Porcelain Rose (620/2) at the distal half of segments shaded most delicately to white at the mid point but blending to a faint, exquisite green deep in the throat. The base of each segment was astonishingly touched with a spot of bright red that made it look almost accidental or as if someone had purposely attempted to artificially add an improvement. Posterior portion of segments apt to be darker Porcelain Rose 620/1 to 620 (RHS). Very round, full faced and flat. The blooms all angle upward 20° to 45°. Because of this the six blooms were crowded indeed on a single scape. Perfectly named. Perhaps this should have been included under bicolor classification but it leaves one with the feeling that he has seen the most delicate of pink flowers.

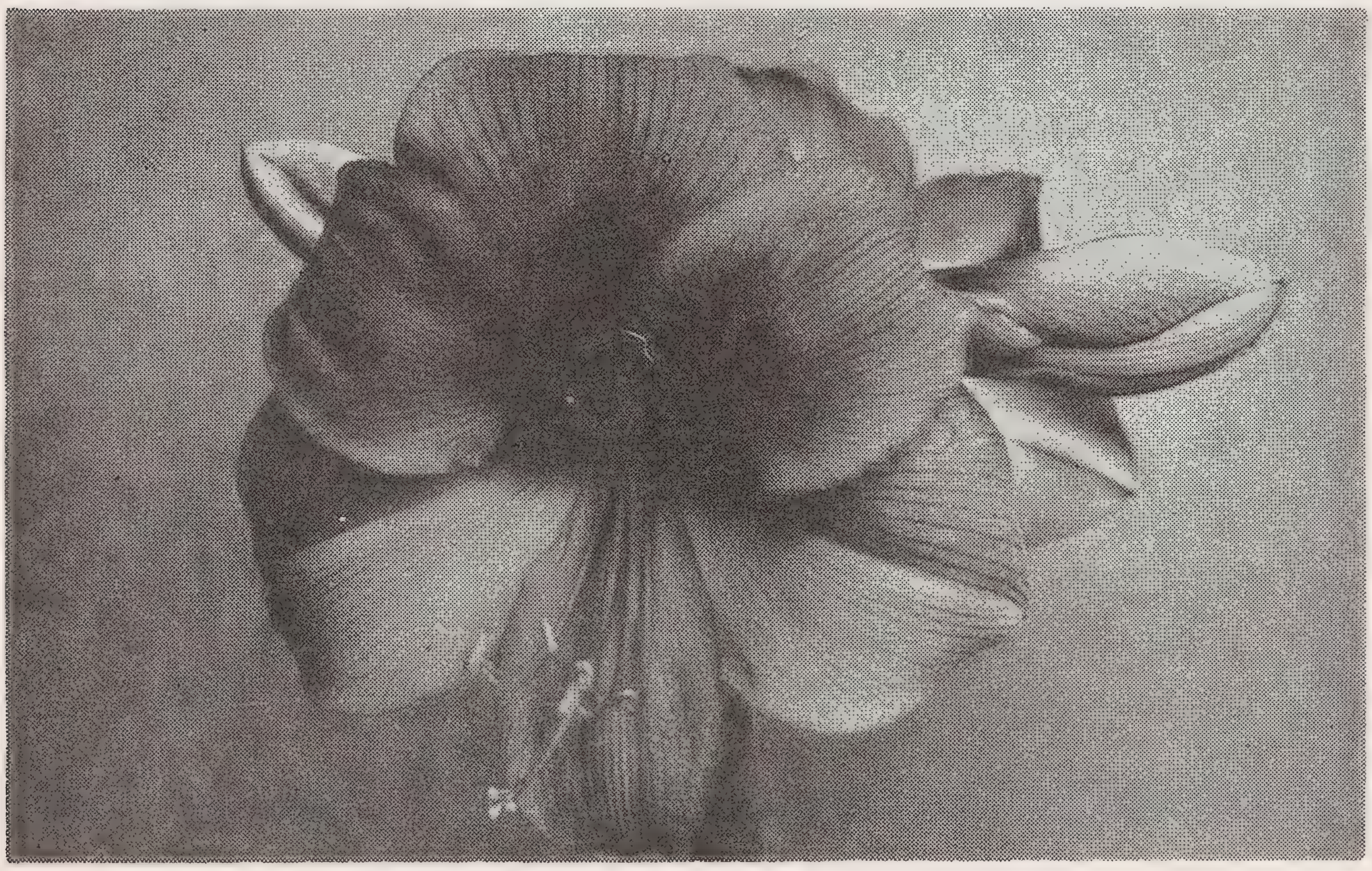


Fig. 21. Hybrid *Amaryllis* 'Doris Lillian'.

'Rose' (John Hix). This is exactly like Warmenhoven's 'Sweet Seventeen' in every respect. Chinese Coral 614/1 (RHS) Grade B plus.

'Fidelity' (Ludwig), Grade AA. (See Fig. 20.) Porcelain Rose, 620/2 (RHS). Very wide segments. Medium sized bloom. Flat face. Center of throat has an apple green which gives much character to the color of this flower.

'Doris Lillian' (Ludwig), Grade A plus. (See Fig. 21.) On a good sized bulb two scapes of four blooms each with 7-inch face. Small bulbs had two blooms per scape. Cherry (722/3). Tends to the crimson or bluish side as it ages. The color is most intense and is always clear. The form is invariably good. Incidentally, it is most vigorous in the open ground, offsets generously and its seed is gratifyingly vigorous.

'Pink Perfection' (Ludwig). Carmine Rose (621). Grade AA. Seven-inch faces. This and 'Doris Lillian' have proved to be the best of the rose varieties for me. It is another good offsetter with vigorous seeds and is more hardy in the ground than some. Here in California it can be depended upon to be vigorous in the ground. The color is less brilliant than 'Doris Lillian' and it is more apt to show greenish posteriorly than the latter. It seems better than 'Pink Favorite' which shows more green but one might well suspect that all three of them along with Ludwig's 'Margaret Truman' are closely related if not of the same parentage.

SALMON

Howard & Smith salmon self. Grade B plus. Poppy Red (16/1). Very clear tubular shaped. Much veining. Again posterior segments are wider than anterior ones—a characteristic of Howard & Smith's strain previously referred to.

PICOTEE

Howard & Smith's. There were several of these. The picotees were not distinguished by being pure whites with picotee. The picotees for the most part were fine red margins on white blooms but the segments were blotched with red like the cheeks of the ladies of fashion of the 1920's. This was not unattractive though they were not purely picotee on white. For the most part they were of good form and were graded A minus. The only pure white, if the green in throat were ignored, with picotee were two bulbs of Herman Brown's. These were the most perfect picotees but lacked good form. At the present time I know of no source where a pure picotee might be obtained as such. van Tubergen withdrew their picotees from the market because they would not come true from seeds and were impractical from a commercial standpoint.

REDS

The reds are undoubtedly the eye catchers of them all. This year as last the two clones of van Meeuwen, 'Queen Superior' and 'Purple Queen' (also called 'Superba') were most outstanding both rating AA. 'American Express' of Ludwig was next but almost equally preferable though the form was quite different. In some ways the latter was more outstanding in that it presented a more flat and rounded face that from a distance caught the eye more readily.

'Queen Superiora' (van Meeuwen) Grade AA. The buds unopened were Currant Red 821 (RHS). Throat Blood Red from 820 deep in center to Scarlet 19 on remainder of segments distally. Actually the bloom has a darker appearance than the color chart can indicate with an over-all scarlet sheen reflected from light that gives one the impression that the color was artificial in its sparkling brilliance. It is a most capricious flower and does not always open as easily as some. When it does it is so spectacular that one has difficulty in believing one's eyes. It is possible that the crinkled and twisted petaloid "ears" in the throat may complicate the opening process. The blooms often angle upwards about 45 degrees. It is said that this makes the flower more desirable.

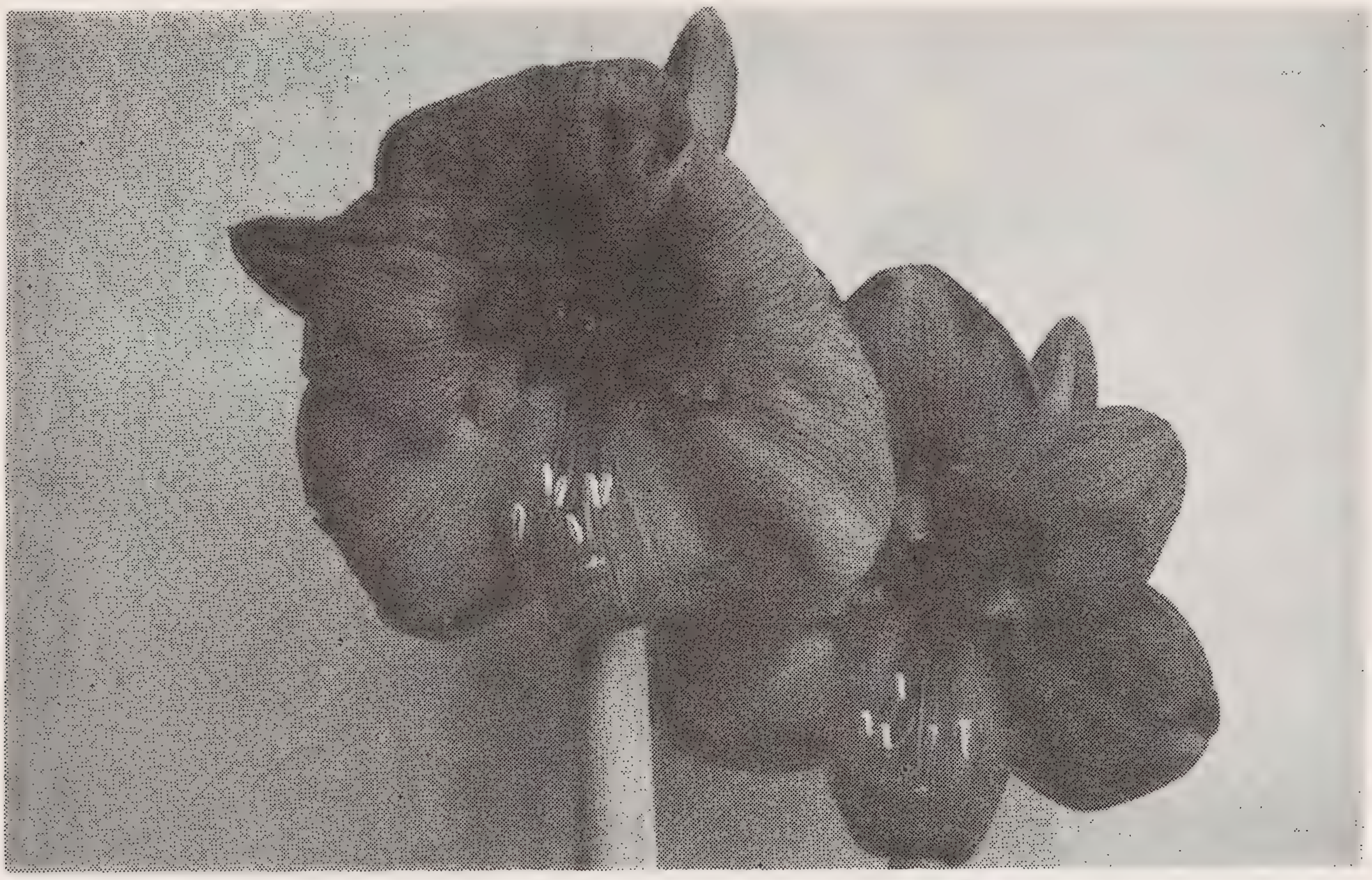


Fig. 22. Hybrid *Amaryllis* 'Ludwig's Scarlet'.

'Purple Queen' (van Meeuwen). Grade AA. This is the same as 'Queen Superiora' in all respects except that it is a deeper red. Though it has never shown "purple" for me it is almost a blackish-red and I'd rather have it this way than purple. This is the same as 'Superba'.

'Lady Helen' (W. E. RICE) Grade A. Segments wide at mid-portion and pointed at tips with trumpet form. Mandarin Red 17 (RHS).

'Ray Denslow' (Ludwig) Grade B plus. Dutch Vermillion 717/2. Full face, short tube. Scanty yellow streaks in throat. Startlingly brilliant in its ability to reflect light. Tends to become extremely large. The large round flat face so desired by most amaryllis fanciers is a common characteristic of the Ludwig varieties. This one is 8 to 9 inches across the face the measurements in each case taken with ruler laid on segments—no effort being made to stretch segments to increase the measurement size.

'Ludwig's Scarlet' (Ludwig) Grade A minus (See Fig. 22.) Dutch Vermillion 717/2 to 717 (RHS). Almost no tendency for yellow streaking in throat. Very bright.

'American Express' (Ludwig) Grade A plus. Again the 8 to 9 inch face. The form in this variety is the ultimate in flat rounded blossoms. Not only that but the texture is so sturdy that it will hold its shape without recurving backward. The color varies according to the circumstances of heat and light. There is usually a yellow streak 2 inches long at the base of each segment in the throat if in the very bright sun. This does not detract somehow from the quality of the bloom. It is most dependable to draw exclamations from onlookers. The fact that it has no ''ears'' in the throat portion of the segments gives an illusion that the face of the flower is much larger than it actually measures. Dutch Vermillion 717/1 (RHS).

'Bleeding Heart' (Ludwig). Signal Red 719/1. Large bloom, wide segments, ears in throat.

'Peacefulness' (Ludwig). Grade B plus. Vermilion 18 (RHS). Good clear color with few yellow lines in throat. Tubular bloom. Flower star-shaped. It has a gleaming scarlet glow that increases from the mid portion of segments to the tip not unlike a neon light when viewed in the direct sunlight. The throat is somewhat deeper in shade.

'Alcyone' (van Meeuwen) formerly called 'Bordeaux'. Blood red 820 in throat to 820/2 on face of segments. Very dark red and perfectly clear anteriorly with only a minimal tendency to green along the proximal half of keel posteriorly. Crenated wavy margins with the crinkled ears twisted together in the throat. Very graceful. Grade A plus. This one bloomed January 10, 1955. Small scratchy yellow lines in the throat ruled out Grade AA.

'Franklin D. Roosevelt' (Ludwig) Grade A. Orient Red 817 (RHS). Another deeply dark red. Appropriately named. Consistent bloomer year after year.

MORE EXPERIENCES WITH DUTCH HYBRID AMARYLLIS

John T. Weisner, *Florida*

In the 1954 edition of Herbertia the author told of some of his experience in the propagation of Dutch amaryllis, both from seed and by the cuttage method. Since writing that article approximately one year's time has elapsed. First of all, he reported that he had had exceptionally good growth on 'Doris Lillian'. In fact, some bulbs were growing as much as 3½″ in little over a year's time. You can imagine his surprise last spring when this flower bloomed and he found it not to be 'Doris Lillian' but an ordinary Dutch self-colored red of approximately 7½″ to 8″ in diameter. In surveying the amount of growth that these seedlings and the bulbs from the cuttage method have made he has found that all of the reds misnamed 'Doris Lillian' have reached at least 3½″ in diameter. Many of these are 4″ or better in size even though they have only been planted 24 months. Five of these bulbs bloomed during the past blooming season. Practically all the 'Ludwig Dazzler' bulbs are at least 3″ in diameter. Many of these are growing up to 3½″ in diameter with all the bulbs still putting up new leaves and growing vigorously. 'Red Master', although growing remarkably well, has not equaled the growth of the 'Ludwig's Dazzler' or those misnamed 'Doris Lillian'. This statement can also be made of 'Albino' and is especially true of 'Red Sparkle' which has grown only fairly well. 'Margaret Truman' grows almost as well as 'Ludwig's Dazzler'. The pink seedling that was labeled No. 10 (as mentioned in the 1954 article) looks vigorous but no bulbs exceed 3½″ in diameter.

'Bordeaux' grown in prepared beds as mentioned in the article of last year grew almost as well as the bulb misnamed 'Doris Lillian'. 'Violetta' bulbs of the same age growing between 'Bordeaux' and the misnamed 'Doris Lillian' have not made the same growth as the others. In fact, they will run approximately 1″ smaller than 'Bordeaux' or the self-red.

Seedlings growing outside in the ground under partial shade have shown variable characteristics. Seedlings of 'Red Master' (selfed) have all made splendid top growth even though most of these bulbs run 2¼ to 3″ in diameter. Seedlings of 'Albino' (selfed) made growth from 2¼″ to 3½″ in diameter. Seedlings of 'Fidelity' are running approximately 2½″ in diameter. One of these bulbs only 2″ in diameter bloomed during the month of May.

Many of the seedlings grown from the Dutch seed planted in September of 1951 bloomed during the past spring. Several of these were very good flowers. Many were average and only a few of these were what the writer considers a poor flower. One remarkable feature was that all of the whites (approximately 15) that bloomed were self-white. That is, no red or streaks. All of the reds (approximately 20) bloomed self-red with the exception of about three. Approximately five salmons bloomed, none of which were outstanding amaryllis flowers. That is, they did not have too good a shape or were rather small in size. There were two rose-colored seedlings, one of 8″ in diameter and the other approximately 9″ in diameter that were exceptionally good if one will be willing to concede that he may have some green in the throat of a rose or pink flower. Both of these have now been cut for propagating purposes.

The writer's observations are as follows: Seedlings of 'Red Master' are rather vigorous growers although they do not make too large a bulb. Seedlings of 'Moreno' are good growers, making large bulbs and having a great deal of vigor. It might be mentioned that the author transplanted 80 small seedlings of 'Moreno' from flats in the spring of 1953. All of these bulbs are living, some of which are now running up to 3½″ in diameter even though they were planted outside in the ground. Seedlings of 'Queen of the Whites' are not vigorous at all. In fact, after blooming 'Queen of the Whites' for four years, the author feels that he cannot expect too much from the seedling of this flower both as to vigor or quality of the flowers. Seedlings of 'Margaret Truman' and 'Pink Perfection' and 'American Fashion' are rather vigorous and should easily make blooming size bulbs in three years.

It is rather odd that the seedlings of some bulbs seemingly have the ability to resist most the pitfalls of a growing bulb while others do not. The author has in mind a rose-colored seedling that he purchased. The seedling from this bulb when crossed with other flowers always gave good strong growing stock. Another oddity that he has noticed is that 'White Giant' does not set seed although pollen from 'White Giant' on other whites make seed. The author is also wondering about the seed from 'Ludwig's Dazzler'. He planted approximately 200 seed of a cross between 'White Giant' and 'Ludwig's Dazzler', and a white seedling using 'Ludwig's Dazzler' as the mother plant. The seeds formed and were normal in all outwardly appearances. However, none of these seed germinated although pollen from the same flowers of 'White Giant' when crossed with 'Albino' made seedlings that germinated almost 100 per cent. The same observations have been observed in propagating seedling from other amaryllis, especially some unnamed seedlings that have not been placed on the market.

The propagation of bulbs by the cuttage method has shown varying characteristics in various bulbs as to the ability to reproduce bulblets. For instance, the writer had a beautiful self-white seedling that was cut for propagation purposes. Only six small bulbs were produced. One can see that this bulb will never reach the commercial field, even though the flower is outstanding.

After the blooming season of 1955 the author feels he will have fairly definite information on what types of bloom one may expect from the seedlings of the following Dutch Amaryllis:

'Red Master'—Selfed
'Queen of the Whites'—Selfed
'Mt. Tocoma' x 'Queen of the Whites'
'Margaret Truman'—Selfed
'Red Sparkle'—Selfed
'Red Master' x 'Moreno'
'Moreno'—Selfed
'Violetta'—Selfed

also several unnamed seedlings.

27 YEARS WITH AMARYLLIS IN NORTHERN ILLINOIS

Mrs. Fred Tebban, *Illinois*

I first became interested in amaryllis in the spring of 1926 in Florida where my husband and I lived at that time. A friend had a long row of these orange-red flowers that bloomed along her fence line in early spring. They were very attractive and I admired them very much. We returned to Illinois in 1927 and purchased a home thirty-seven miles north of Chicago. Shortly thereafter a neighbor gave me a small bulb which she said produced pretty lilies and made a nice houseplant. It seemed to have the same type of leaf that I had noted on the Florida amaryllis so I asked if it was an amaryllis bulb. The neighbor said she had never heard it called anything but a lily, so I grew the bulb and watched and waited for a bloom. In a year or two it not only produced a bloom but several new little bulblets. I found the flower to be much like the Florida blooms, but paler in color and a bit different shape. Later I learned to call it ''Equestre'', and now know that it was the little *Amaryllis striata* var. *crocata,* the old fashioned household favorite. For many years this was my only amaryllis, but it multiplied so rapidly and was such a pleasing pot plant that soon all my relatives and friends had pots of amaryllis too. However, I longed for a red similar to those grown by my Florida friends, and noted in a flower catalog a listing of *Amaryllis* x *johnsonii,* a hybrid. I quickly ordered one and it too grew year after year producing two spikes of bloom of a lovely red shade with a white central stripe and a soft sweet fragrance.

Perhaps ten years after acquiring my first bulb I noted that amaryllis bulbs were appearing in the dime stores so I purchased two to add to my collection. One proved to be a very pretty light red (almost pink), the other a white with red stripes. These were really very nice in both form and color and grew and bloomed very well. This was my first introduction to the Mead strain.

In the meantime I had joined a garden club and had subscribed for a good garden magazine where I found Mr. Houdyshel's advertisements. In 1942 I ordered from him a pink bulb which has really ever since been my best and most satisfactory amaryllis bulb. It generally produces two scapes of flowers each year of a lovely shade of rose pink and is most dependable, blooming at the same time each winter. The form of the bloom too is excellent, and is probably the result of some of his own crosses with perhaps some of the Dutch strain in its parentage.

Then, in 1943 in this flower magazine I read of the amaryllis round robins being formed and hastened to become a member. We soon began exchanging bulbs and seeds, thus all enlarging their amaryllis collections. Through these round robins I became acquainted with Edith Strout, and to her I owe much of my knowledge of amaryllis culture and many of my fine amaryllis seedlings. I have directed two of these amaryllis robins for ten years or more and through them I have met many other fine folks whose hobby is also amaryllis.

In 1943 Mrs. Strout sent me a few seeds of amaryllis crosses that were given to her by Mr. L. S. Hannibal. Only four of these seeds germinated but these four all produced good bulbs. Three bloomed with very brilliant and beautiful flowers, but to this day, eleven years after, the fourth bulb has never bloomed. Why, I do not know, for each year it produces fine leaves and grows well, though never increasing greatly in bulb size. I also have a seedling of the McCulloch Hybrid Strain of which Edith Strout wrote in the 1954 HERBERTIA. It, too, has never bloomed. So I keep watching these two and trying to improve their growing conditions to get bloom from them.

In those early days we talked much of a ''red rust'' disease that troubled our amaryllis, and because of it many bulbs were discarded.

However, on a visit to Florida in 1949, I called on Mr. Wyndham Hayward, and inquired about this disease while discussing amaryllis culture. Mr. Hayward assured me there was no such disease and that red rust appearing on the leaves was only an indication that some condition under which the bulb was growing, was not to its liking. Too acid soil, too cool temperatures, poor drainage etc. might cause this red rust to appear.

As the wonderful Dutch hybrids appeared I have added one or two to my collection each year and have been moderately successful in their culture, though I continually strive for better success and to learn more of their needs and wants.

After joining the round robins and learning more about cultural methods, I began getting away from year round pot culture and began to plant the bulbs in summer in a protected spot in my flower border after all danger of frost was past. This has benefited many greatly, but entirely ruined others for I have lost all of my original *Amaryllis striata* var. *crocata* bulbs, and also var. *fulgida,* and *Amaryllis* x *johnsonii* has not bloomed for many years, but the good Mead bulbs I have and the Dutch hybrids seem to benefit by this method of growth. I lighten the soil in this amaryllis bed with sand and humus and shreaded fertilizer. Last summer I read every article I could find on foliar feeding and from June till mid-August I gave a weekly foliar feeding using chemical fertilizers containing the elements most needed for good bulb growth. I applied this feeding early in the day, about nine a. m., on hot days when the breathing stomata of the leaves would be open to absorb it. This is a heavier feeding schedule than is recommended but since our growing season for amaryllis is so short here, I wanted to make the most of it. When dug, I found all the bulbs had increased greatly in size so I am sure they have benefited from it.

One of my greatest difficulties has been to keep the many potted bulbs growing well after leaf growth starts in the spring. Due to our extremely late spring I cannot place the amaryllis outside until about Decoration Day, and without a greenhouse it is nearly impossible to give them sufficient sunshine to keep leaves from growing tall and spindly and lopping over. This year I am going to try fluorescent lighting in my basement and will give the plants about six hours of light each day after growth starts. I must also be prepared to return them to the basement soon after Sept. 15th because of the danger of early frosts or very cold nights, so I may use the fluorescent lights again at that season if they do not go dormant at once. The only pests that I have had to contend with here are thrip that eat the leaves, spoil the flowers and get beneath the bulb scales. However, with DDT these are now quite easy to control.

Over the years I have had only moderate successes and many failures. For instance, I soon learned that my friends' Florida amaryllis were not *Amaryllis* x *johnsonii,* but were the old Florida *Amaryllis belladonna* var. *major* (mis-named *equestris).* After three unsuccessful attempts I have given up trying these as pot plants or in my summer amaryllis bed for our growing conditions are just not right for them.

My aim has been to make a good collection of colors and shades of color, and not of species and varieties. Since 1943 I have kept a consistent record of bloom each winter, and in looking back over these records I find how many I have given away or discarded that I now wish I had kept, for I believe that every amaryllis that gives a pleasing bloom is worth saving even though it may fall short of some standards. I like very much the flat faces and the rounded petals of the lovely Dutch hybrids, but I also like *Amaryllis striata* (rutila), the good Meads and *Amaryllis* x *johnsonii* of the earlier years. In short, I LIKE AMARYLLIS.

AMARYLLIS GROWING IN DOWNEY, CALIFORNIA

J. F. STEWART, *California*

In my younger days my gardening activities were confined to doing my share of the spade and hoe work for my mother, an enthusiastic nature and flower lover who always had an extensive garden, and gardening was at that time uninteresting to me. Later—much later—after growing some things of my own in my own garden, the fever grew on me and has been constantly increasing. I went through what is no doubt the usual course of growing almost every flower for which seeds were obtainable, including the more common annuals, perennials and bulbs that will grow in this part of the country. I still can't resist growing some of the favorites, but am concentrating on hybrid Amaryllis. Concentrating during evenings and week-ends, that is, since the week-days are spent (or should it be ''wasted''?) earning a livelihood.

I started growing Amaryllis in 1943, after having seen some of Mr. W. E. Rice's bulbs in bloom. The first seeds were purchased from Rex Pearce, but none sprouted. Mr. Rice gave me some seed from his field-grown stock, a number of which bloomed and were, of course, beautiful, but were not too satisfactory for breeding stock. Those next acquired were some Howard and Smith bulbs which were quite satisfactory, and some imported Dutch bulbs from a local dealer, which were not. These Dutch bulbs were a complete failure, since, though two of them lived long enough for the flowers to open, the bulbs all rotted.

In three or four more years the stock of bulbs had increased enormously, but it was becoming apparent that the material was not as good as it should be for satisfactory breeding and that something should be done to correct the situation.

By this time, the Amaryllis-growing hobby had taken over.

A small glasshouse was purchased, proved to be entirely too small, but served its immediate purpose. I still have it and use it, but have purchased a larger one, about nineteen feet by twenty-four feet. I contacted the American headquarters of the Dutch bulb growers association, whose advertisement I had seen, for the name of someone from whom I might obtain some Dutch bulbs. Among the names they gave me was that of Mr. Wyndham Hayward, of Winter Park, Florida; a name which I now know is familiar to all AMERICAN AMARYLLIS SOCIETY members.

This was most fortunate for me. Through him I immediately obtained some Ludwig seed and some Dutch bulbs, and have had much more material from him since, both Ludwig and Warmenhoven, all of which has been completely satisfactory. He has helped me with advice and I have enjoyed a not profuse but very pleasant correspondence with him.

The acquisition of these bulbs, and the seeds which are now blooming size bulbs, opened the second phase of my enjoyment of, and experience with, Amaryllis. I now had stock to be proud of and which gave me good breeding material. Unfortunately, when I was in school, botany was for girls. Zoology was O. K. for boys, but not botany. I now very much regret my ignorance of so many things I should know, but am doing what I can about it and will gradually acquire some of the necessary knowledge.

The Ludwig seed which I have had has given good results, although I have been able to get only about 75% germination. Those that have bloomed to date have come almost entirely true to color and there has been a high percentage of first grade blooms. In one crop of pink and salmon seeds about 25% bloomed as two-year-olds, and these were interpollinated, producing a few thousand seedlings which are being kept isolated in the faint hope that some of the early-blooming trait will be inherited. These seedlings will be grown outdoors, whereas the parents were grown in the glasshouse in gallon cans, which may have accelerated their development. The last crop of bulbs from imported seeds will bloom this year. From now on all new seedlings will be from my own crosses. In addition to the above-noted seedlings from two-year-old parents I have three groups of crosses which are being grown separately: Dutch pollen on my American bulbs, my pollen on Dutch bulbs, and Dutch on Dutch. These are all being grown out-doors and there are about six or seven thousand bulbs of all ages in the ground. A few of these are due to bloom this year, more next, and many thousand in 1956—I hope.

In addition to these I have one more crop of my own American seedlings, without Dutch parentage, which will bloom and be heavily culled out this year. My own blooming size bulbs have been culled to the point that they are all of known characteristics and are planted in rows of separate colors. The flowers are all of good color, of reasonably good form, and over six inches in diameter. So far, reds and stripes predominate, with fewer salmon and pink. There are no pure whites in this stock.

Outdoor growing seems to be quite successful here, in a light sandy loam which is very pleasant to work and drains well. The beds have been well fertilized with chicken and cow manure and 5-10-10 commercial, and occasionally some liquid ammonia which is available to me. Grows good weeds, too. We usually have enough frost to kill the leaves and force the bulbs into dormancy, but not enough to harm the bulbs. This year the frost has been light and to date, February 1, most of the bulbs are still growing.

I have been doing quite a bit of vegetative propagating for three years and it is a most fascinating procedure. There are two hot-beds now, about five feet by seven feet each, and the wiring has just been finished so that two more may be activated. They are heated by thermostatically controlled soil-heating cables and are not too expensive to operate, but it was difficult to find the equipment, part of which was assembled to order. The coil is laid on the bottom of the bed, with the cables spaced at about four inches on centers. Across these are laid one-quarter inch by two inch redwood slats at about eight or nine inch centers, to protect the lead-covered heating cables from damage. The spaces up to the top of the slats are filled with sand, and the propagating flats set at this level. The spaces up to the top of the flats are also filled with sand, making the bed about five inches deep. Common building sand, with the fine gravel sifted out on an eight-mesh screen, is used as a propagating medium in the flats.

When the propagating program was started, a lower temperature was used, and it has gradually been increased to the present 68° to 82° spread. This seems to be the best temperature for my conditions, but when the new beds are ready I expect to try still higher temperatures on a few expendable bulbs, in an attempt to establish a maximum.

Both the Luyten and Traub methods as described in the 1935 Amaryllis Society Year Book have been given thorough trials, with the Traub method giving much better results. The over-all average now is about forty to fifty bulblets potted up from each bulb propagated. From one light pink only four have been potted up, with a possibility of one or two more yet to develop; and, from one beautiful large white propagated last summer, sixty-one are potted off and growing, with several more possibles still in the flat. From one large salmon there were eighty-three bulbets, but not all of these will mature. Satisfactory results have been obtained from all colors of the Dutch stock. Cuttings have been made during all months except April and May, and results seem to show that July, August and September cuttings do best; but those made during October, November and December also do well. From now on an effort will be made to get all cuttings into the beds during the summer and early fall, so the process will be far enough along to allow the beds to be cleaned up for the next year and part of the space to be used for forcing blooms, if desired, in the spring. Our spring, by the way, begins in January.

About the only major difficulty encountered has been a bad siege of leaf scorch *(Stagnospora)* on the bulbs in the glass-house. It is bad right now, but may be somewhat arrested, although it is difficult to be sure. A friend, Mr. R. D. Durbin, in the University of California at Los Angeles plant pathology department, has advised dipping in either formalin or mercuric chloride and has recommended a specific program for me, to be followed by spraying with bordeaux or copper-lime dust. This program has not yet been tried to a sufficient extent to provide any conclusive results, but a greater effort will be made later on and perhaps there will then be something of value to report.

Quite a large number of buds are now showing in the glass-house and it won't be long until blooming season. First the blooms there, in March, April and May, and then those outdoors from June until the first frost in the fall. There is no telling what the new crop will produce—

maybe some wonder bulbs. As Jimmy Durante says, "I love that kind of carrying on!"

THE FASCINATING **HAEMANTHUS**

Armyn Spies, *Illinois*

Haemanthus are African bulbous plants, of which the greater part come from the Cape region. The flowers are very showy in some species and often numerous. Like most of the Cape bulbs, they usually are summer and autumn flowering, the flowers usually preceding the leaves. The foliage is large and luxuriant and often the scape is spotted and colored. In some species the leaves and stems are also spotted, usually with a brownish color. Some of the individual flowers are as much as two inches across and the whole ball of bloom ranges upward to nine or ten inches in diameter. This is my favorite plant of the *Amaryllidaceae* next to the amaryllis itself, but they are not generally known and are considered as curiosities in this country. Their season of growth is usually from six to eight months for some and others remain evergreen for the year round.

Their culture is very simple. A soil mixture of equal parts of loam and peat, with a little sand added, suits them. The bulbs should be planted with the top half protruding from the soil. Several may be planted in a large pot, or they may be planted singly. Water sparingly until the roots are formed and growth starts.

While blooming, they should be put in a cooler situation to keep the flowers longer. When the leaves begin to grow, the pot can be put in a window that is partly shaded, for these are partial shade plants. The temperature should be around 55 degrees at night and around 70 during the day. The plants should be watered when dry and fed with a complete fertilizer once a week while in active growth. A complete water soluble type will suffice.

When the plants have completed their growth period and they show signs of resting, such as the leaves turning yellow and drying, they should be dried off and put in a dry, warm situation until they show signs of flowering and wanting to grow again. It is not necessary to repot the plant each year, the bulb can be kept in the same pot and fertilizer applied as needed. They resent repotting and also should be in a small pot so they become rootbound. Most of them will do well in a 5-inch pot, with the exception of *H. Katherinae,* which when older takes a 10-inch pot. There are no serious pests for these plants so they are relatively pest-free.

Descriptions of the most popular haemanthus follow:

H. albiflos, type variety, is probably the best known of the *Haemanthus* group. It has two to four leaves about 4 inches across and sometimes a foot long or longer with good culture. The flowers are white, and the umbel will carry 100 or more flowers. The plant is evergreen, blooming in the fall, but with pot culture, it has been known to flower at any time.

H. carneus is a small species that is a winter grower. It has two small, prostrate, almost round leaves. The umbel of flesh pink flowers comes in July or August. Growth starts after flowering and goes dormant in the late spring.

H. coccineus is the true BLOOD LILY. This is my favorite. The umbel of scarlet or blood-red flowers comes in August after a three months dormancy. The scape is an orangish color and brightly colored with red blotches. The spathe is a bright shiny orange color and flairs somewhat while blooming, making this bloom most attractive. Two long, almost pendulus green leaves follow the flower. The underside of the leaves are blotched a brownish color. This would be a suitable plant to hang in the partially shaded window.

H. Katherinae has been called the most beautiful of flowering bulbs both in flower and foliage. The umbel is usually 10 inches in diameter and the huge red flowers usually number upwards to 125 or more. About 5 broad leaves spread from the top of a 10-inch stem. It flowers usually in June, but sometimes comes as late as September. Usually around the first of the year, the neck splits and new growth emerges, making this an evergreen plant. Sometimes the neck does not split, and when this happens, the neck is cut from the base of the stem upward and the growth pried outward to relieve the pressure. The old growth can be cut off about 4 inches above the break or cut.

H. multiflorus resembles *H. Katherinae* in appearance. The umbel is somewhat smaller usually 6 inches and the flowers are red. The stem supporting the leaves is spotted brown. It has about the same growth cycle of *H. coccineus.*

There are other species, but they are not in the trade and a few may be found in private collections.

There are several hybrids of the *Haemanthus* and probably among the best is *H.* x *Andromeda* which is a *H. Katherinae* x *H. magnificus* cross. This is described as being the largest flowered and most vigorous of all. The gigantic spherical head of salmon crimson-red comes in June.

'King Albert' is a *H. Katherine* x *H. puniceus* cross. The flowers of this are red and the umbel is on a short stem.

For the beginner I would recommend that at least the *H. albiflos* be grown, for it is the easiest grown of the species. *H. coccineus* most probably would be as easy to grow but one must recognize the growth cycle and adhere to it in order to have flowers. It is very well worth while for the gorgeous bloom.

Haemanthus should be ordered early in the year and they will be sent at the proper planting time, thus making it possible to see the flowers the first season.

Haemanthus produce red fruits containing seeds. The flowers are hand pollinated by rubbing the palm of the hand over the flower umbel, when open, every few days as all of the flowers do not open at the same time. This spreads the pollen to the pistils. Wait until the fruits are quite red before taking from the plant. The outer pulp should be removed and the seed planted by pressing down slightly into the soil but not covering. Quite a number may be planted in a large bulb pan. The soil should be rather loose as growth begins with the emergence of a radicle from the seed. If the soil isn't loose it may have to be broken to allow the radicle to penetrate. This radicle penetrates the soil and forms a bulb from which leaves soon emerge.

THE INCOMPARABLE **LYCORIS AUREA**

Sam W. Sayler, *Florida*

It is difficult to understand why this incomparably lovely plant is not grown in every garden in the Southeastern United States, and also in Texas, and California. On the east Florida coast it grows and blooms to perfection as shown by my own experiences.

During the past several years I have grown *Lycoris aurea* obtained from gardens in St. Augustine. About three years ago, *Lycoris aurea* became available by importation from Japan. The price was reasonable and I ordered 100 bulbs from Japan. During the first year, the imported bulbs bloomed about two weeks earlier than the local form. I thought at first that this difference was due to transplanting, but during the second, and also the present year (1954), the earlier flowering trait was again noted. The bulb-necks of the St. Augustine form appear about ½ inch above the ground a few days earlier than those of the Japan-imported form, and the latter produce offsets more abundantly.

The tepalsegs of the St. Augustine form are slightly different from those of the Japan-imported form and are not quite as ruffled. The greatest difference is however in the foliage which is very dark green and glossy in the Japan-imported form, and much lighter green and not glossy in the St. Augustine form.

Both forms set seeds freely to self-pollination *here* although others, in various locations and under pot culture, report that the St. Augustine form is mostly self-sterile. Last year I had seedlings about three inches high in several pots, but unfortunately they were lost during the dormant stage. I intend to self-pollinate and also make crosses with other species next year, and will report on these experiments later.

Both forms of *Lycoris aurea* multiply freely here in Fernandina Beach, and bloom regularly each year. One bulb of the St. Augustine form planted about 5 years ago now (Sept. 1954) has about 18 or 20 bulb-necks above the ground. They will probably all bloom at the same time within the next three weeks.

The soil in our garden is common to this locality, and no fertilizer has been used in growing *Lycoris*. They probably would respond with a still lovelier floral show if a little mineral fertilizer were applied.

NERINE BOWDENII AND OTHER NERINES; NEGLECTED BEAUTIES

Wyndham Hayward, *Florida*

One group of the Amaryllids is conservatively described as surpassing all other fall-blooming bulbs in sheer, fragile beauty and delicate loveliness, and that distinction belongs to the Nerines. In them there is brilliance of color, sparkling overlays of gold dust, the rich, silky sheens of scarlet, pink and crimson shades, and all the grace and charm that the flowery kingdom can provide.

Nerines, it might be said, are a luxury of the bulb world, something refined beyond the common ken of ordinary beautiful plants, feminine in their gentleness as growing things, and yet with a certain firmness and strength of character under good conditions of culture which compel admiration beyond the due of their ornamental qualities alone.

And it is this inherent strength in the flowers which makes them so desirable. There is nothing fleeting and wispy about the Nerines in flower. The stems are wiry and strong, if slender, and the umbels last in good condition for weeks, when grown in a cool, ventilated atmosphere.

Nerines are popular in greenhouse collections in England, and there have been a few notable collections in America, among them that of the Thomas Roland firm at Nahant, Mass., and there are classes for these fall-blooming beauties in the fall Chrysanthemum show of the Horticultural Society of New York. They are features of the London Royal Horticultural Shows in Fall.

Perhaps in line with their feminine nature, the Nerines are temperamental creatures. They require that little touch of extra care which makes them a success. Actually they are easier than orchids and begonias and many other pot plants, but they have their little idiosyncracies which must be respected.

Nerine bulbs can be purchased from a California dealer. In Florida they grow best outside under oak trees, in pots of sandy leaf-mold loam, enriched with a little well-rotted cow manure and neutralized by the addition of a small quantity of finely ground oyster shell. This seems to suit the bulbs in Florida where the soil is naturally well on the acid side in most locations. In California the Nerines are more at home, and a number of species and hybrids are offered by the dealers.

The reader should consult previous volumes of Herbertia for other illustrations of various nerines.

The best modern account of Nerines is in Col. C. H. Grey's "Hardy Bulbs," Vol. II, London, 1938, pages 83-93 where the British author discusses most of the species which are to be encountered in the trade at this time.

The species which is the subject of this article [Fig. 23] is *Nerine bowdenii,* W. Watson. It is related to the old *N. flexuosa,* and is a fairly modern addition to the group, having been found in east Cape Province, South Africa, in 1903. It has proved one of the most amenable to garden and pot cultivation. The bulbs are usually 1½ to 2 inches in diameter, shaped like an Italian wine bottle, and remain in flower for a period of several weeks in the fall. The individual flowers open gradually, and the umbel stays in good condition with several flowers open many days at a time, if grown cool.

Col. Grey states that this species is hardy in the South of England if planted in a sheltered position with proper soil. All Nerines seem to require rather a fertile, but sandy, well-drained type of soil, yet must not lack in moisture during their growing season. However, the curse of all Nerines is over-watering, especially with poor drainage conditions. This has cost the writer many good Nerine bulbs in the past in his Florida experimenting, and the same problems must be met in the greenhouse.

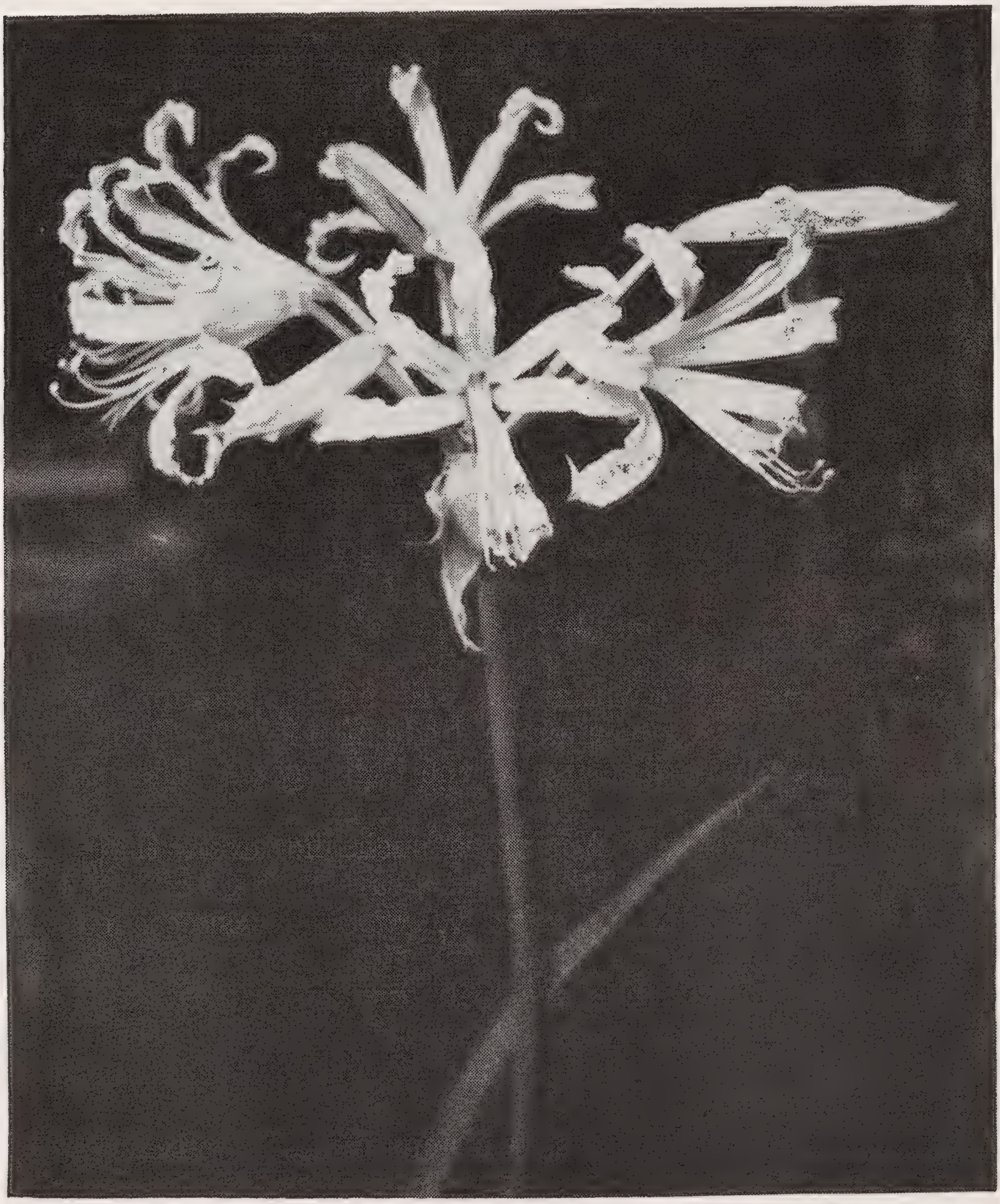


Fig. 23. *Nerine bowdenii;* a luscious pink in color. Photo, Wyndham Hayward.

Nerine bowdenii has more the evergreen habit than most other Nerines, although a few others as the dainty *N. filifolia* are nearly evergreen. The best known species of Nerines are *N. curvifolia, N. filifolia, N. Bowdenii, N. pudica, N. flexuosa,* and *N. sarniensis.* Because of the readiness with which the Nerines seed, they have been hybridized frequently and a long list of the hybrid named varieties is mentioned in the English literature on the subject.

The Nerines, like various other interesting Amaryllids, are all members of the South African flora. They are generally grown in pots, but in Southern California, especially around Santa Barbara, it is said, succeed in the proper location in outdoor plantings. They want good, sandy loam, and small-sized pots with extra good drainage. Excessive heat in summer with moisture present will usually result in rotting of the bulbs. For this reason they are not adapted to ordinary outdoor culture in Florida and similar sub-tropical climates where there is a heavy summer rainy season. There the Lycoris are more at home. However, in Florida and similar climates the bulbs may be dried off in shaded greenhouses in summer.

They seem to flower better in the small sized pots. Fives or fours are all right for largest bulbs. They make their main leaf growth during the winter months like *Lycoris,* but do not like wet summers as the *Lycoris* seem to do in Florida and the Southeast generally.

In winter when growing, the plants should be given all the light possible. A cool temperature not below 45 or 50 degrees F. is satisfactory. When the leaves wither and die off in late spring the bulbs should be rested. During the summer, little or no water should be given, unless to prevent actual withering of the bulb roots. The bloom spikes will appear in the fall.

The constitution of the *Nerine* is such, however, that it resents moving. It will do better two or three years in the same pot and the more root-bound the better. *Nerine bowdenii* has succeeded with the writer in the open in Florida, the pots being grown under the partial shade of oak trees. The rains are well dispersed by such foliage and possibly in this way the pots were spared a sloshing and drenching which they would have received in the open in Florida otherwise during the rainy season of summer.

Nerine bowdenii is a lustrous, luminous pink, ''good enough to eat'' as they say, and a despair to the artist who would seek to capture the exact shade in his oils. The scape is about 14 inches long and the umbel may have eight to ten or more delicate, crisped flowers, the petals having a deeper colored stripe down the middle.

The Nerines have an interesting place in botanical history. One species, *N. sarniensis* (the specific name means ''of Guernsey'') is so called because it was first observed by botanists growing in the sands of that Channel Island southeast of England where it had been washed ashore from the shipwreck of a vessel which was bringing the bulbs from South Africa. This is a beautiful thing but little known in America. It has been cultivated in the Channel Islands for 200 years, according to the European writers.

The December, 1949 number of the English magazine, ''Gardening Illustrated,'' carried on page 283 an excellent illustration of the Nerine Hybrid ''Hera'', as shown at the Royal Horticultural Show in London Oct. 4-5, where it was exhibited by Clarence Elliot, who showed ''a number of vases of a beautiful hardy Nerine, ('Hera') with glistening rose-pink flowers and deeper shadings.'' The flowers were carried on 2-foot stems, and the plant had already received a First Class Certificate in 1920 so could get no higher award. The article says the plant ''has since (1920) grown outdoors in a Gloucestershire garden with complete success.''

However, those English gardens are deceptive in their hardiness and one should be careful about planting any *Nerine* bulbs outside in United States gardens without abundant precautions for full protection against freezing weather.

In the Southern states, *Lycoris radiata* was known for years as *Nerine Sarniensis,* and ''The Guernsey Lily'' and so described and listed in leading Southern gardening texts of the time. The masquerade was solved through the efforts of members of the AMERICAN AMARYLLIS SOCIETY in 1935-36. So far as known, no bulbs of the true *N. sarniensis* exist in the Southern states.

ENDURING DAYLILIES

J. B. S. NORTON, *Maryland*

Any large mass of data collected finds other uses than that for which it was formed. The annual ''Popularity Poll'' of the Hemerocallis Society gives the 100 names receiving the most votes of a large number of gardeners, and is mostly of use to growers in selecting daylilies for their gardens.

After adding their dates of publication as given in ''Descriptive Catalogue of Hemerocallis Clones'' (1949) I am using them to indicate those that have remained in gardens longest, knowing that most of the older ones have been discarded.

The oldest in this 1954 poll is 'Mikado'; this and four others all originated by Dr. Stout, 'Taruga', 'Dauntless', 'Patricia', and 'Linda', are the only ones included from 1929 to 1936. The next oldest is 'Hesperus' (Sass), 1937. Three go back to 1938, 'Duchess of Windsor' (Traub), 'Chloe' (Nesmith), 'Persian Princess' (Nesmith). Mrs. Nesmith's 'Bold Courtier', 1939, and her 'Pink Charm' and 'Glowing Gold', 1940 are still in the elite list.

The number still strong in gardens increases slowly in 1941: 'Caballero' (Stout), 'Revolute' (Sass), 'Ruby Supreme' (Wheeler), 'SuLin' (Nesmith), and 'Gay Troubadour' (Nesmith); but 10 published in 1942 are still counted worthy: 'Athlone', 'Painted Lady', 'Purple Waters', 'Mrs. Hugh Johnson', 'Queen of Gonzales', 'Mrs. B. F. Bonner', 'Black Prince', and 'Purple Sage', all from Russell's garden; also Watkins' 'Swan', and Nesmith's 'Royal Ruby'.

In the years 1943 to 1946 only 12 remain: 'Potentate', 'Jean', 'Easter Morn', 'Orange Beauty', 'Amherst', 'Babette', 'Mamie Lake', 'Gold Cargo', 'Mission Bells', 'Prima Donna', 'Georgia', 'Midwest Majesty'.

The flood of 55 more in 1947 to 1951 are too close to now to evaluate for enduring quality.

CRINUMS IN SOUTH TEXAS YARDS

Lenore Frels, *Texas*

Today (October 23) I visited at a home here in Mathis that has a foundation planting of *Crinum augustum*—a tall stately variety that holds its foliage up.

Now you may be wondering why I am writing about crinums. Well, as a matter of fact, I have seen a lot of crinums in my lifetime, as everyone who has lived in South Texas has. You can't escape them. They are in almost all the old yards and in some of the new. Six times this summer I have seen crinums blooming in vacant lots where probably a house once stood.

I got into this crinum writing because I sent the editor a post card asking why he didn't get out a crinum edition and he sent a postcard right back asking why I didn't write an article on crinums. You could have knocked me over with one tepalseg of *Crinum mooeri minor*.

I have a bulb of *C. moorei,* a dainty little thing that I am tempted to try for a while in a pot. It goes dormant in the late summer or early fall; grows along slowly through the winter and spring; and just sits still when the weather gets hot. This is its third fall in my yard and it hasn't bloomed yet. But surely it will bloom. If it doesn't it will be the first crinum that refused to bloom in South Texas. I really think if the rabbits would leave it alone it would get up enough energy to produce flowers. Every time it grows a nice set of foliage a rabbit comes up out of the guajilla brush and eats the leaves off.

It was the rabbit that decided be to do this piece for the editor. At least I know what varieties the rabbits like. During the summer I bought a new variety (new to me) called *C. ornatum* with pretty crinkly foliage that matches the name. It hasn't bloomed either, but as soon as it sent out leaves the rabbits had a feast. A little piece of poultry netting rolled into a tube fixed it up until it gets big enough to fend for itself and at the rate it's growing that won't be long. Next, *C. scabrum* (also a new bulb) looked as if it had had a bite taken out of its new foliage so it got a little wire fence. But most Crinums don't appeal to rabbits. I've had a white EASTER-LILY-LIKE *Crinum* and a MILK AND WINE LILY ever since I've had a garden and no rabbit ever took a second look at them.

Last spring in late March I cut up a small bulb of a kind called shell pink, just to see if Crinums can be propagated by cuttage, set them in a pot of compost, and buried the pot under a banana. The cuttings soon sent up leaves (but not as quickly as some Amaryllis cuttings made the same day) and the rabbit took a bite of the new leaves, taking the cutting out of the very loose compost and spit it out and left it alone.

The white Easter-Lily-like Crinum goes by a number of names here. Some call it RAIN LILY because it blooms after summer rains. Some call it AUGUST LILY because it blooms usually in August, but that is because it usually rains here in August. Some call it ANGEL LILY, but I have never known anyone who spoke of it as a Crinum. There are undoubtedly thousands of them in our little town and countryside, and it is a slow multiplier. I dug mine last summer for the first time and there were 11 bulbs in a clump where I had originally planted one white AUGUST LILY and one MILK AND WINE LILY so close together that they formed one clump. They had been there 20 years or longer. I had tried once before to separate them but gave it up as an impossible feat for the bulbs had reached far down into the earth. But we have recently moved and I wanted them in my new garden. It took me and one other person about two hours to dig them out without breaking too much of the roots.

It gives a Crinum a decided setback to cut off all roots when digging. But if they can be moved without breaking the main roots they seem to grow right along, not even wilting the foliage in midsummer if plenty of moisture is supplied before and after moving. A shipment of Crinums that came recently from California had some with a good amount of roots and some with almost none. Those with roots had five full leaves each ten days after planting. Those without roots I hope will start making foliage before a freeze (if we have a freeze. Some years we don't, although usually we have several days and nights of temperatures below 30, not often below 24).

But back to the AUGUST LILY (not *C. augustum)*. It had long drooping foliage and very many flowers open at one time, so that the spike almost always falls over to the ground. The tepalsegs are recurved on the tips giving the flower a frilly appearance and sometimes, but not always, there is a very faint bit of pink showing down the center of each tepalseg. Probably the pink shows up in cool cloudy weather, but fades out in hot sunshine. I have noticed that Crinums 'Louis Bosanquet' and 'Cecil Houdyshel' bloom a much paler shade of pink in summer than in spring.

Crinum augustum has a tree like shape and holds its leaves erect. If I were in the florist business I think I would try some of them in tubs or big pots for church decoration at weddings. I have never had one but I have noted that they are usually not crowded in clumps and the offsets are sometimes dug out without disturbing the main bulb, so it is likely that these bulbs do not grow naturally very deeply in the earth. It is a profuse bloomer and also blooms after rains. The bloom spike and the unopened buds are a most delicious shade of rose red but the fully opened flower is a disappointment. The buds are five to seven inches long and the tepalsegs are five to eight inches long and about ¾ inch wide, not by actual measuring but by approximations.

The tepalsegs are just simply too long for their width. The color is fine, a lavender pink striped affair, but the tepalsegs get entangled when the wind blows and the flowers are similar to a granddaddy long legs in general build, hence one of the popular names is PINK SPIDER LILY. However the lovely color of the buds and the tropical appearance of the plant make up for the flower. And it has a very nice fragrance.

Recently when I was going about my part time job of being a country correspondent for our neighboring city newspaper, The Corpus Christi Caller-Times, said job being mostly writing accounts of weddings, teas, garden club meetings, and women's doings for the Women's News section, I stopped to admire an unusual arrangement of sanseveria and *Crinum augustum,* the unopened rose red buds and green mottled sanseveria rising from a low bowl, the long segmented flowers placed at the base where they could fall gracefully. It was quite unusual. A garden club member with me said mournfully, ''And just to think, when we bought our house there was a whole row of those lilies growing in the yard and I couldn't rest until I got them dug up and sent off in the garbage. Now I'd love to have them.''

Two MILK AND WINE LILY varieties are plentiful here. One has a lily-shaped bloom with rose stripes, about 12 blooms to a spike, maybe three open at a time, the kind I have—slow multiplier. Two bulbs of this are blooming now.

The date has moved along since I started writing this. It is now November 10. We have had three frosty mornings in a row, but the MILK AND WINE LILY blooms were not touched. However I noted that the newer leaves of *C. scabrum* were burned by the frost so I am guessing it will be tender to cold.

Last week I visited two old homes with crinum plantings. Historical Round Lake at San Patricio, seat of an early Irish settlement, has about a thousand feet of crinum borders along walks, all one variety, a MILK AND WINE LILY with wide open recurved blossoms. I was told that the crinums were obtained from a convent at San Patricio about 1876, the sisters having brought them there. Other homes in that vicinity have quantities of the plant so I assume it must be a quick multiplier. The clumps in the borders at Round Lake had an average of five or six bulbs each. Some were in bloom but their main blooming season is in the summer.

At the other home, in Alice, I was told that the white AUGUST LILY variety had been brought from England when the family came to Texas in the 1850's. They were growing luxuriantly beside a pool. I can't remember ever having seen crinums used as a poolside planting before; but probably that's because this part of Texas doesn't have many pools.

My first interest in crinums came in 1950, when, country corresponding as usual, I walked into the basement of a local church and saw before me a magnificent bouquet of bright pink flowers.

''What are the flowers?'' I asked.

''Oh those are Gwendolyn's pink lilies. You don't mean you've never seen them before. She brings them to church every year about this time.''

After that I heard ''Gwen's pink lilies'' discussed at the garden club. No one knew what they were. Everybody wanted some. I decided to find out. I thought they were crinums.

Gwen said she didn't know what they were. Just pink lilies. Her mother had got a pink lily bulb 25 years before in New Orleans. The florist in her home town had brought in a number of the pink lily bulbs and planted them for the flower trade. When the townspeople began asking what they were the florist said she didn't know—just pink lilies.

When they asked to buy a bulb she refused to sell one at any price. Gwen's mother, a flower lover, thought the bulb she found in New Orleans might be the same. She didn't learn its name. It started blooming after a few years and was very pretty, but only bloomed once a year, while the florist's pink lilies behaved like rain lilies and bloomed after every summer rain.

I pushed my inquiries further and found others who knew of the fabulous ''pink lilies.'' I was told that the bulbs in the florist's yard formed big clumps and she had them dug from time to time and reset. Among the tales was that the man who did the digging put one bulb in his pocket and planted it at his home. When it bloomed the florist saw it and made him bring it back.

While I was in pursuit of the lily's name I started buying crinums. A friend, who saw my Crinum 'Cecil Houdyshel' in bloom, hunted the florist's yard up while on a trip that weekend. The pink lilies were in bloom. She reported rows upon rows of clumps of them and thought they were the same as mine. She learned that the business had been sold and the new florist was selling bulbs, but to get one you must have your name put on a waiting list and when you did get one it would cost $12.50.

An inquiry to Mr. Houdyshel brought the information that the bulb was not likely Crinum 'Cecil Houdyshel', because, although it first flowered in 1916 not many bulbs were sold until the late '20's.

I dismissed the subject from my mind but went ahead hunting pink crinums because by this time I was deeply interested—no, that is putting it too mildly. Completely fascinated is more accurate.

Some small bulbs given me by Gwen bloomed this summer and appear to be the same as one I bought under the name ''Shell Pink''.

Lately, I was told that the florist business had been sold again and the place was taken for a business site. A bulldozer had been sent in and it bulldozed the pink lilies down. Maybe I should write ''finis'' now. But somehow I can't quite see all those neighbor women sitting in their porches and watching that bulldozer destroy all of those bulbs. Surely somebody rescued a few.

Crinums that I have acquired are 'Ellen Bosanquet', 'Louis Bosanquet', 'Cecil Houdyshel', 'E. J. Elwes', 'Peachblow', 'Sovereign', 'Burgundii', *C. ornatum,* 'Ivory Princess', *C. scabrum, C. podophyllum,* 'Virginia Lee', 'Gordon Wayne', *C. mooeri, C. bulbispermum, C.* x *Powelli alba,* and one described as ''beautiful pink with deeper pink stripes''. I am a sucker for a line like that. I bought three.

Then I have *Crinodouna* x *howardii* and 'Lon Delkin'. The latter hasn't yet bloomed for me but *howardii* was the finest flower that ever bloomed in my yard. It opened on July 4, with two or three blooms open each day. On July 12 the temperature went to 106 in the shade, although it was a little cooler at our place which is out of town—just 102 on the back porch. *C.* x *howardii* could have been cut with three flowers wide open at 6 p. m. on July 23.

Only one crinum has ever set seed for me—'Louis Bosanquet', one lone seed, which I grew into one wee bulb. There is a crinum in local yards which looks like *C. bulbispermum* and seeds freely, but my *bulbispermum* has failed to set seed.

'Louis Bosanquet' bulb was a disappointment. I didn't think it particularly pretty, but it did bloom once in February and it multiplies at a medium pace, a worthy trait in crinums.

I have observed that a bulb that produces very many offsets will not be too free with flowers. The shell pink bulbs which I suspect may be 'J. C. Harvey' (I have never seen this clone to know it) make a furious amount of offsets. Two that are growing side by side were reset last year. From one I removed the offsets to give friends and it produced three spikes of bloom and nine offsets this summer. The other had the offsets left on and it is now a clump of 17 bulbs, one large, three or four medium and the rest small. It produced two spikes of bloom, rather weak spikes.

The bulb called 'Sovereign' hybrid has foliage and offsets exactly like the shell pink but hasn't bloomed for me yet. In fact most of them haven't bloomed in my garden up to the present. They were either small bulbs when I got them or the roots had been cut off and consequently I did not get bloom the first year.

'Ellen Bosanquet', a big bulb, sent up three spikes of bloom. A young bulb of the same, which reached blooming size late in the summer, bloomed six weeks after the normal season for that variety. So it seems that careful attention to setting out young bulbs and caring for them might be rewarding with out-of-season blooms.

I have two large bulbs and two medium bulbs of Crinum 'Cecil Houdyshel'. One large bulb made eight spikes of bloom during the summer. The other, which has an offset, made five. The spikes come out one after another around the neck of the bulb, each new spike being adjacent to the last. The one with eight spikes had completed the circle around the neck of the bulb when the eighth spike came out. I am hoping that the bulb will have grown enough by the coming summer to make room for ten spikes. The bulb that made five spikes is larger but the space where the offset was growing was skipped when the flower spikes came out.

The date is now November 23. I have been out to look at that *C. mooeri minor.* No sign of a leaf and no sign of a bloom spike yet. I'm going to give it until Christmas day to bloom and if it hasn't bloomed by then I'll move it back to a full sun location, where it made nicer foliage than it has in a shady spot. [Editor's note.—*Crinum moorei* requires partial shade and will not thrive in full sunlight.]

EDITOR'S MAIL BAG

The Henry Hybrid *Cyrtanthus* are the most satisfactory subjects in my garden in spite of the fact that we had to move in the fall of 1954. They were taken up in November in Arcadia and replanted in my garden at La Jolla in early December. The flower scapes had elongated several inches when they were replanted, but in spite of this the flowers developed normally. *Cyrtanthus* are long-lasting but in this cool winter climate near the Pacific Ocean, the flowers are still in good condition after more than six weeks (January 28) when this was written. Recently Mr. Hottes, the eminent horticulturist, who is a neighbor, accepted some blooms to be used for making a painting. These valuable Henry Hybrid *Cyrtanthus* will soon be offered by Giridlian, Box 444, Arcadia, Calif.

It is with the deepest regret that we hear that Prof. W. R. Ballard, of Hyattsville, Maryland, a faithful contributor to Herbertia for many years, has suffered a stroke in December 1954. We hope that he will soon fully recover. Prof. Ballard is carrying on most interesting breeding projects including among others the hybridization of daylilies, iris, roses, narcissus, magnolias, grapes, etc.

Dr. Thornburgh and family have recently moved into their new home in Palos Verdes Estates, Calif.

Dr. J. S. B. Norton, the venerable plant enthusiast, of Hyattsville, Maryland, writes (January 22) that they have had no real winter as yet—the lowest being 20° F. so far. He has taken Jasmine cuttings indoor for flowering, and has had fine flowers on his *Tulbaghia fragrans*. Mrs. Morton is having the best success to date with her African Violets.

Mr. John F. Cooke, Jr., Garden Dept., Cleveland Public Schools, is in charge of a fine educational program which should do much toward acquainting the younger generation with growing things early in life so that they may either take up such work as a profession, or be able to appreciate garden activities later in life as a satisfying avocation. Mr. Cooke is chairman of the new School Gardens Committee, and he will be pleased to exchange information with others similarly engaged. His fine article appears in this issue of Herbertia.

It is with deepest regret that we record the death of Mr. Pierre D. du Pont, a Herbert Medalist, in 1954. Mr. du Pont was a great *Amaryllis* enthusiast, and maintained one of the best collections of *Amaryllis* hybrids at Longwood Gardens (950-acre estate) near Kennett Square, Penna., which he acquired in 1906. Mr. du Pont left $60 million to maintain Longwood Gardens which have been open to the public since 1921.

The Herbert Medalist for 1954, Mr. Thomas R. Manley writes, under date of February 26, 1955, that he is going into business for himself at Rt. 1, Lenerpool, Penna., beginning March 15, 1955. He will be growing gladiolus (20 acres), rotation crops and of course he will continue his work with the evaluation of hybrid *Amaryllis* clones. He is testing Ludwig and Warmenhoven Amaryllis clones and will report on these in Herbertia, grouping these under Reginae and Leopoldii divisions. The editor is certain that he expresses the consensus of the members in wishing Mr. Manley all success in his new business.

Mrs. A. Primo, 707 Ruth St., Mobile, Ala., has recently undertaken a radio program—"Garden Clinic." During 1954, she received the "Caldwell Life Membership Award" given for outstanding horticultural achievement by the Alabama State Council of Garden Clubs.

The members are requested to send in interesting news items for the Editor's Mail Bag.

[PLANT LIFE LIBRARY, continued from page 80.]

There is a section on Vegetation Zones in Colorado, by David F. Costello; a glossary of terms; and an index of plants. This book is indispensable to all who are interested in the flora of Western United States. Dr. Harrington is to be congratulated on a monumental task well done.

IRRIGATED SOILS, Their Fertility and Management, by D. W. Thorne and H. B. Peterson. 2nd ed. Blakiston Co., 575 Madison Av., New York. 1954. pp. 392. Illus.

The expansion of research showing that "maximum yields from irrigation are dependent on the proper balance of such factors as fertility, plant population, plant characteristics, crop rotation, soil physical properties, and soil moisture," a premise on which the first edition was based, has justified the appearance of this second edition. Emphasis has been placed on basic principles rather than on field practices. The subject matter treated includes problems of irrigated regions; soil as a medium for plant growth; soil, water and plant relations; the salt problem; evaluating land for irrigation, source and quality of irrigation waters; measuring irrigation water; planning a farm for irrigation; irrigation practice; drainage; reclamation and management of saline and alkali soils; control of physical, and biological properties of soil; maintaining organic matter in soil; minerals and plant growth; fertilizer elements and materials; using fertilizers; soil management for field, fruit, vegetable and specialty crops; and farm planning. This outstanding book is highly recommended.

MODERN GARDENS, by Peter Shepheard. Frederick A. Praeger, 105 W. 40th St., New York. 1954. pp. 144. Illus. $9.50.

This attractive book deals "specifically with the planning, design and planting of the modern garden . . . to satisfy the practical and aesthetic needs of the present generation." Examples have been selected from the work of leading landscape and garden designers now working in many countries of the Western world. The 291 black and white illustrations are truly outstanding. This excellent book is very highly recommended.

THE MAJOR FEATURES OF EVOLUTION, by G. G. Simpson. Columbia University Press, 2960 Broadway, New York. 1953. pp. 434. Illus. $7.50.

This concise, easily readable book "presents a general review of the history of life as seen in the fossil record and interprets the evolution of

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GENERAL EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY

Box 150, La Jolla, California

PREFACE

Mr. W. M. James contributes two interesting articles to this general edition of PLANT LIFE—California vacation trips and Abies venusta; and the Saratoga Horticultural Foundation with which he is associated. There is a brief review of Brook's new method for dwarfing and early-bearing in fruit trees. Dr. Corliss reports on a rack for exhibiting flowers. This should be of special interest to those who are charged with the staging of flower shows. There are also articles on rose breeding, dwarf thyme as a ground cover, and the genus Ipheion. Mr. Paul R. Young contributes an outline for the Gardening Program in the Cleveland Public Schools. Brief book reviews under "Plant Life Library" complete the issue.

March 30, 1955 *Hamilton P. Traub*
Harold N. Moldenke

[PLANT LIFE LIBRARY, continued from page 112.]

life in the light of the most recent data from paleontology, genetics, systematics and related sciences." The topics considered include rates of evolution; variation; mutation; population and selection; adaptation; evolution and adaptation; trends and orientation; extinction; relicts and irreversibility; horotely, bradytely and tachytely; higher categories; and patterns or modes of evolution. This stimulating book is indispensable to all who are interested in biology.

THE MIND AND THE EYE, by Agnes Arber. Cambridge Univ. Press, American Branch, 32 E. 57th St., New York. 1954. pp. 146. $3.00.

This little book offers a "generalized analysis of the biologist's approach to his own subject and to philosophy." In the first part the topics considered are—the biologist and his problem; the mode of discoveries in biology; the logical background of the biologist's problem; the biologist's use of analogy; and the biologist and the written word. In the second part the chapter headings are—biology and truth; the basic assumptions of biology; biological antitheses; antitheses and dialectic; and the mind and the eye. All of us who have followed the thought provoking work of Agnes Arber through the years will welcome this recent stimulating contribution.

FUNDAMENTALS OF ECOLOGY, by Eugene P. Odum. W. B. Saunders Co., Philadelphia. 1953. pp. 384. Illus.

This book was written by an eminent authority "to serve as a textbook in a college course, and also as a reference for the naturalist and for interested workers in related fields, including the great and growing army of conservation workers, sanitary engineers, and other applied ecologists who need to be familiar with background work and theories in ecology." The book is organized in three parts: (1) basic ecological principles and concepts, (2) the habitat approach, and (3) applied ecology. This concise, easily readable text is highly recommended.

[PLANT LIFE LIBRARY, continued on page 146.]

CALIFORNIA VACATION TRIPS AND **ABIES VENUSTA**

W. M. JAMES

For several years the work that I was doing allowed only a short vacation which had to be taken with almost no advance notice, and there was little opportunity for time for short trips in between. As a consequence visits with old friends were few and far between.

On August 1, 1953 I was appointed as Horticulturist at the SARATOGA HORTICULTURAL FOUNDATION. This work is not nearly as confining as that done the past few years and this summer an ample vacation could be planned in advance.

Soon after Dr. Traub moved to California, I had an opportunity to visit him for a short time and was fortunate enough to see the green *Amaryllis viridorchida* in bloom. This flower must be seen to be appreciated. This summer I spent an evening with him and consider it a real treat to be able to sit and talk and see what he is doing in his laboratory.

Dr. Coit of Vista is probably not known to many of the readers of PLANT LIFE. He has been working with *Ceratonia siliqua,* commonly known as CAROB, for many years. He is spending two months in the Mediterranean region this fall studying this plant where it has been important for centuries. It was very interesting to be shown his work and listen to him give information that had been obtained by years of work and study. I saw an experimental planting of carobs which were in fine condition. Budded seedlings four and five years old which were bearing. These trees had never had a drop of water except the natural rainfall which is only ten to twelve inches annually in that region. They were growing near Vista, in the southern part of California about ten miles from the ocean.

Occasionally I have an opportunity to visit Mr. and Mrs. Orpet in Santa Barbara. He is well and active and still as interested in plants as he ever was. A visit there is always interesting.

Mr. Herman Brown has retired from his prune orchard near Gilroy and is living in Palo Alto. He has a greenhouse and a small piece of ground where he is growing his choicest *Amaryllis* bulbs. Time visiting with him is well spent.

Probably the highlight of the summer was a visit to a stand of *Abies venusta.* We left Morro Bay and followed State Highway #1 to San Antonio Road near the San Louis Obispo and Monterey County line. This road follows an old Indian trail across the coastal ridge of the SANTA LUCIA MOUNTAINS near Twin Peaks (4700 ft.) and Cone Peak (5000 ft.) to MISSION SAN ANTONIO DE PALA. The mission is on the old SPANISH TRAIL between Monterey and Los Angeles. It is a well graded narrow dirt road steep enough to require low or second gear most of the time, and with many sharp turns.

The SANTA LUCIA FIR *(Abies venusta* Koch; Plate 8) (see The Silva of California by W. L. Jepson) has a more restricted habitat than any other fir in the world. Its total range in the SANTA LUCIA MOUNTAINS

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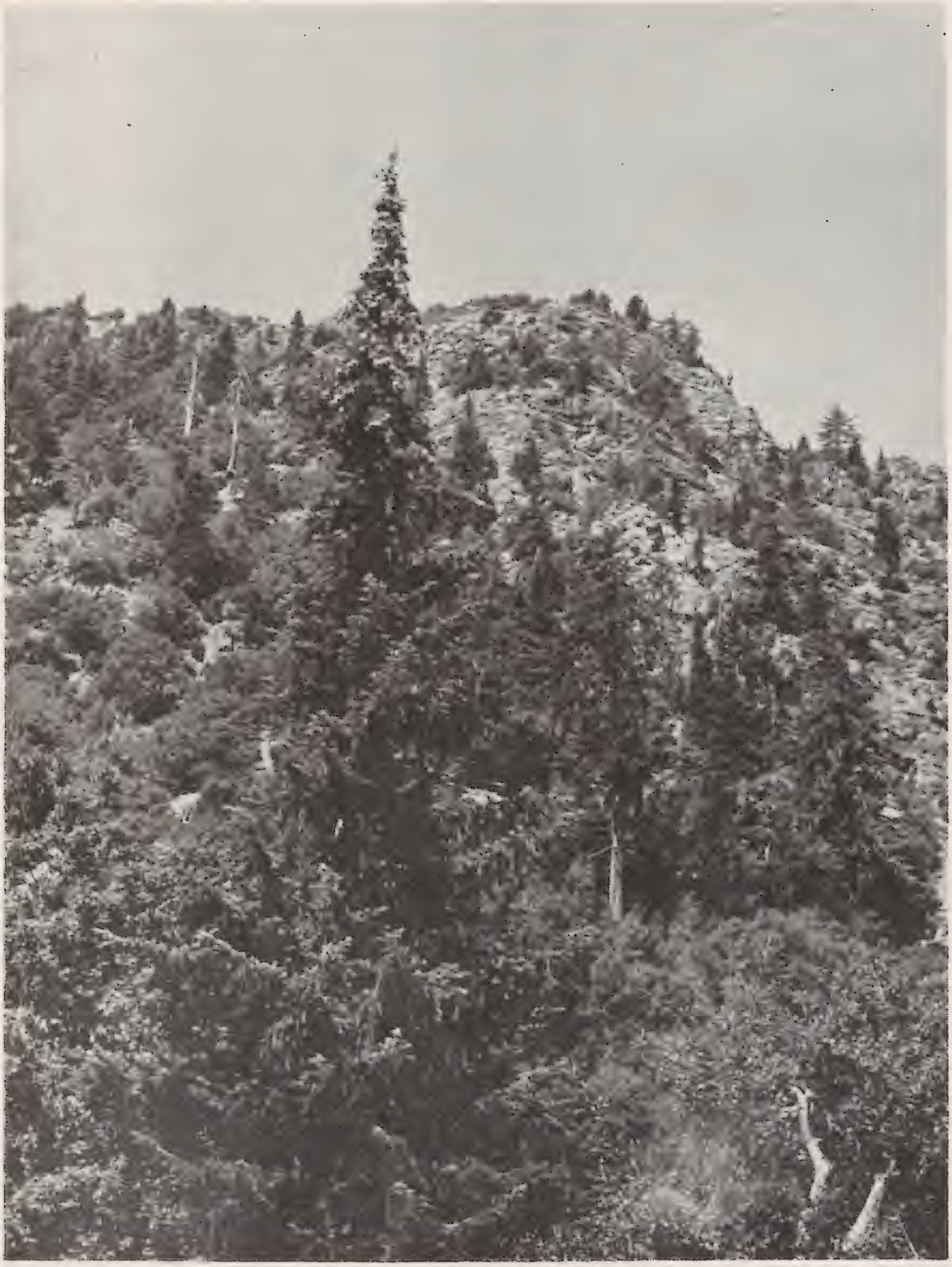

Abies venusta Koch, the Santa Lucia Fir, in its native habitat in Santa Lucia Mountains of California. Photo by W. M. James.
Plate 8

in Monterey County is about forty five miles from north to south covering a strip one mile or less in width. These mountains are extremely broken with very precipitous slopes and dense chaparral areas. It inhabits slopes from the moist canyon bottoms to dry rocky summits on the eastern and western sides of the coastal ridge. It is also well isolated geographically. No other species of the genus is known within two hundred and twenty five miles to the north, one hundred forty miles to the east and one hundred twenty miles southeasterly.

This fir was first discovered scientifically in 1831 by Thomas Coulter, a botanical explorer, who in 1832 made the overland journey from Monterey through the South Coast Ranges to SAN ANTONIO DE PALA MISSION and thence across the Colorado Desert to the mouth of the Gila River.

Following Coulter, many of the early botanists visited this area to see these unusual trees and obtain seed for use in Europe. However, the Franciscan Fathers at MISSION SAN ANTONIO knew of these trees long before the coming of these botanists. They were called ''Incensio'' by the Padres because from the cones resin was obtained for incense to be used in Chapel religious ceremonies.

Abies venusta is a slender tree from thirty to one hundred feet tall. The cones are borne on the younger branches on the top of the tree, are heavily covered with resin and their weight bends the branches down very close to the main trunk. The older branches remain and assume a horizontal position on the lower part of the trunk. At a little distance the tree resembles a slender church steeple with a very narrow pencil-like top. [see Plate 8.] This form is so characteristic that it furnishes a means of identification about as far as the trees can be seen. Seeing these trees in their native habitat is just about as impressive as the first visit to a natural grove of *Sequoia gigantea.* They are off the beaten track, but not too difficult to reach in a car with good brakes and a driver with steady nerves.

Just a word about my name in closing. ''W. M.'' stands for ''Wilfred McDonald.'' For some reason that I never learned I was always called ''Donald'' as a boy and my friends still use that part of my name.

PLANT NOTES

HAMILTON P. TRAUB, *California*

HESPERALOE SP. CLINT ♯514. Collected by Mr. & Mrs. Morris Clint in the Lower Rio Grande Valley, near Rosita, Starr County, Texas. The flowers are bright rose, without any creamy-white in the throat. Mrs. Clint has pointed out that this species appears distinct from *H. parviflora* var. *englemannii* on the basis of several plant characters and it may be *Hesperaloe funifera.* Mrs. Clint will report later more in detail on these plant characters. In the present note the dried capsule and seeds are briefly described.

Capsule globose, trilobed with a pointed apex; 19 mm. long, 8 mm. wide, slightly larger before drying. Seeds black, usually 7 to 15 seeds per locule, rarely as low as 4; usually 7 mm. long (varying from 6.5 to 8 mm.); usually 5 mm. wide (varying from 4 to 6 mm.); seeds typically D-shaped, flattish by pressure but somewhat thickened toward the rounded edge. When seed number per capsule is only a few, the seeds are much thickened toward the rounded edge, and appear like miniature quarters of an apple.

SARATOGA HORTICULTURAL FOUNDATION

W. M. James

On January 1, 1951 a horticultural experiment station under the name of Saratoga Experimental Gardens was established near the town of Saratoga, California by Mr. and Mrs. Raymond D. Hartman, with Mr. Maunsel Van Rensselaer as Director. For many years Mr. Hartman has been a leading horticulturist on the Pacific Coast, and owner of the Leonard Coates Nurseries Inc., with headquarters in San Jose, Calif. Mr. Van Rensselaer is well known for his work in developing and directing the Santa Barbara Botanic Gardens.

In May 1952 the Experimental Gardens were reorganized as a private, non-profit corporation under the name of Saratoga Horticultural Foundation Inc. It is managed by a self-perpetuating Board of Trustees, and a Director who is responsible for the technical administration. Professional guidance is given by a Board of Counselors consisting of individuals prominently identified with western horticulture, arboriculture, botany and landscape design. The land, buildings, equipment, and plant stock on hand at this time were presented to the Foundation by Mr. and Mrs. Hartman.

The Experimental Gardens and the succeeding Horticultural foundation were organized primarily for the introduction, selection, and improvement of shade trees and native California plants suitable for garden use. This will include study of scientific laboratory findings related to propagation and plant growth for the purpose of improving nursery techniques and reducing costs. All work is done on a commercial scale and information obtained will be made available to nurserymen as progress warrants it. Plants grown are sold to nurserymen on a non-profit basis.

The sale of plants on the wholesale market will make the Foundation partially self-supporting. However, the extent and quality of experimentation and investigation will be dependent on supplemental income derived from public support. The commissioner of Internal Revenue has granted tax exemptions. Contribution of funds to the Foundation are allowable deductions in computing income tax and are exempt from gift tax. Bequests are exempt from estate and inheritance taxes.

Propagating material and plants of several improved forms of shade trees and native plants have been received through the generous cooperation of nurserymen, arborists and horticultural institutions throughout the country. An outstanding form of male tree of *Ginkgo biloba* is being propagated rapidly. A *Liquidamber styraciflua* tree with excellent shape and very fine fall coloring is in quantity production. Other projects with trees include *Liriodendron, Pistacia chinensis, Magnolia grandiflora* and *Ceratonia siliqua.* Several forms of *Ceanothus* and *Arctostaphylos* are being propagated extensively. Some *Ceanothus* hybrids are being tested. Other native plants are being studied intensively in an effort to find easier methods of propagation.

Although equipment and space are still somewhat limited, a great deal of progress has been made toward the goal Mr. Hartman and Mr. Van Rensselaer had in mind when the SARATOGA EXPERIMENTAL GARDENS were first established to aid in the improvement of exotic trees and native trees and shrubs for the benefit of the people of the Pacific Coast.

ROSE BREEDING, 1952-1954

HAMILTON P. TRAUB, *California*

The writer had started rose breeding projects before, but due to moving the seedlings were left behind. One of these projects was undertaken in Florida in the 1930's with the objective of providing hybrid tea-type roses that could be maintained indefinitely in that humid subtropical climate. The parents used in these experiments were the hybrid rose, 'Louis Philippe', the CHEROKEE ROSE, *Rosa laevigata* Michx., (pink and white forms), and the MACARTNEY ROSE, *Rosa bracteata* Wendl. All of these maintain themselves indefinitely in Florida and should be the starting point for a race when hybridized among themselves and also with outstanding hybrid tea roses. Some one in Florida should duplicate these crosses which should prove most interesting.

FIRST CALIFORNIA EXPERIMENTS, 1952-1954

During the season 1952 various rose clones were obtained with the objective of breeding mildew resistant roses for California. This disfiguring disease is the bane of the rose grower in this state and frequent sprayings are required to keep the plants healthy. Starting with some mildew resistant clones that are not outstanding for flower size, crosses were made with various outstanding hybrid tea clones at 1531 Rodeo Road, Arcadia, beginning in 1953, and the seeds were harvested in the fall of that year. The seeds were pretreated as recommended by Allen (1951). The seeds were removed from the ripe fruits, and were kept in the refrigerator for several months in 1953-1954 on moist spahgnum peat on the bottom of wide mouth glass containers with perforated screw caps. Unfortunately, this method as used by the writer was not very successful. Mold appeared on the seeds and most of them were destroyed. The sound seeds were planted in pots in the greenhouse. However, out of the entire lot only two seedlings were obtained to start the project.

R-153. A cross between two climbers, 'Blaze' x a mildew resistant clone with pink flowers. The seedling appears to be a vigorous climber which did not flower during the first season under outdoor culture at 1531 Rodeo Road.

R-253. From the same cross as R-153, but this proved to be a very dwarf plant that produced a single flower when a few weeks old after only a few leaves had been produced, and while still in pot culture in the greenhouse. This phenomenon had been noted before among *Citrus* seedlings which sometimes bloom soon after germination after only a few leaves have been formed. As a rule they do not survive. In the case of R-253, the plant did not die after the flower had faded. The plant was set out in the garden in the spring where it again flowered in August 1954. This time a cluster of three flowers was produced. The flowers in both cases were very small, perfectly double, and light pink in color. Up to the present, the plant is not more than 8 inches tall and was almost lost in September 1954 when the gardener hoed off the top. Fortunately, enough of the lower part remained and it sprouted again in October 1954.

SEED CROP, 1954

During the season 1954, additional rose crosses were made at 1531 Rodeo Road, Arcadia. Since the writer had to leave Arcadia, in the Los Angeles basin, on doctor's orders due to severe smog-induced sinus trouble, the move to La Jolla near the Pacific Ocean was necessary in November 1954. Unfortunately, all of the seeds of the 1954 crop were not fully matured at moving time. The immature fruits were cut with at least 12 inches of stem with leaves attached. These cuttings with fruits were placed in a saran plastic bag. The base of the stems were enclosed in wet spaghnum peat, and the bag was closed. This provided a substitute for a Wardian case. On arrival, some of the fruits were turning red, but were not mature. The cuttings with fruits were removed from the saran bag, and the bases were placed in spaghnum peat in a wooden flat. In this medium most of the fruits matured rapidly with the exception of a few that were quite green when the cuttings were originally made. These latter were left in the flat, and to make certain that too much drying would not take place, they were bent over and most of the stem portions were covered with peat, and one side of each fruit was placed against the moist peat. When this report was written in December 1954 at Camino de la Costa, La Jolla, these fruits were not mature, but one or two were showing a little reddish coloring.

The ripened seeds were refrigerated in December 1954. The method of Boerner (1954) was followed. Some of the seeds were removed from the fruits as controls, but in most cases the seeds were left in the fruits which were frozen in ice cubes in the freezer compartment. There they will be left for a few months and the seeds will then be removed from the fruits and planted in the spring of 1955.

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[Boerner, E. S.] Popular Gardening, June 1954, p. 39.

NEW METHOD FOR DWARFING AND EARLY BEARING IN FRUIT TREES

Justin Brooke, in Garden Illustrated (London), LXXI: 198. 1954, reports on his preliminary experiments begun two years ago with a new method for achieving dwarfing and early bearing in fruit trees. The plan is to remove a half-inch band of bark in March or April from the stem of young trees (2 year old) or on two or more branches of older trees, and replacing it ''upside down—not inside out, be it noted, but just reversing the bark so that the lower edge is placed at the top of the cut and the upper edge at the bottom.'' It is then fixed in place with ''transparent adhesive tape or any other suitable material.'' He points out that shoots sometimes develop below the ring, and that these must be removed. Aerial roots may also form sometimes but these may be left as they will die. Brooke cautions that ''it must be borne in mind that we are only in the early stages of investigation at present, and it will be some years before final proof of its value or otherwise can be obtained.''—Hamilton P. Traub.

CORLISS RACK FOR EXHIBITING FLOWERS

Philip G. Corliss, *M.D.*,
S. W. Reg. Vice-Pres. Somerton, Arizona

There are many reasons why certain flowers entered as specimen exhibits in flower shows should not be placed in containers on tables. Among the most important are:

(a) The flowers should suggest their natural growth and appearance in the garden. If cut at the ground they should be placed with their stem ends close to the floor.

(b) The length of stem is a factor in awarding points when judging some flowers. The stem cut at the ground and placed on a table puts the flowers at such an height that they are not seen as they appear in the garden so that drooping flowers may appear more attractive on the table than outward—or upward-facing flowers (which may thus lose points when judged at this unnatural height).

When, as Exhibition Chairman of The Hemerocallis Society, I was deluged with queries as to the proper method of exhibiting daylily scapes, I was forced to design the rack illustrated by the accompanying photographs. (''Necessity is the mother . . .''). Figs. 24 & 25.

The entire rack is made from 1″ x 2″ wooden strips.

(1) The end frames are 18″ square and are reinforced with angle irons. The auxiliary frames are nailed together (may be screwed) and they and all the other pieces are attached to the end frames by bolts. This permits easy dis-assembly for transportation and storage.

(2) The base strips may be bolted to the end frames by a choice of three holes for the end of each strip. This permits variation in the size of the containers which are held between the base strips. The holes are

made to accommodate standard containers such as coca-cola bottles for flowers with narrow stems, milk bottles for large-stemmed flowers, etc.

(3) The guard (side) rails are placed at an height which makes the rack assume good balance—two-thirds to three-fourths of the distance from the floor to the top of the frames is best.

(4) The center (top) strip has holes drilled at one-inch (or wider) intervals, through which the stems are placed and into the containers below. The entry cards may be attached to the top strips opposite the holes selected for the stems. The guard rails protect the entry cards and the specimens and permit the racks to be used in the center of the floor as well as along walls. The length of the strips is optional but ten or twelve feet seems to be the best length for easy transportation and storage and to eliminate the use of an additional frame in the center of the strips to support them.

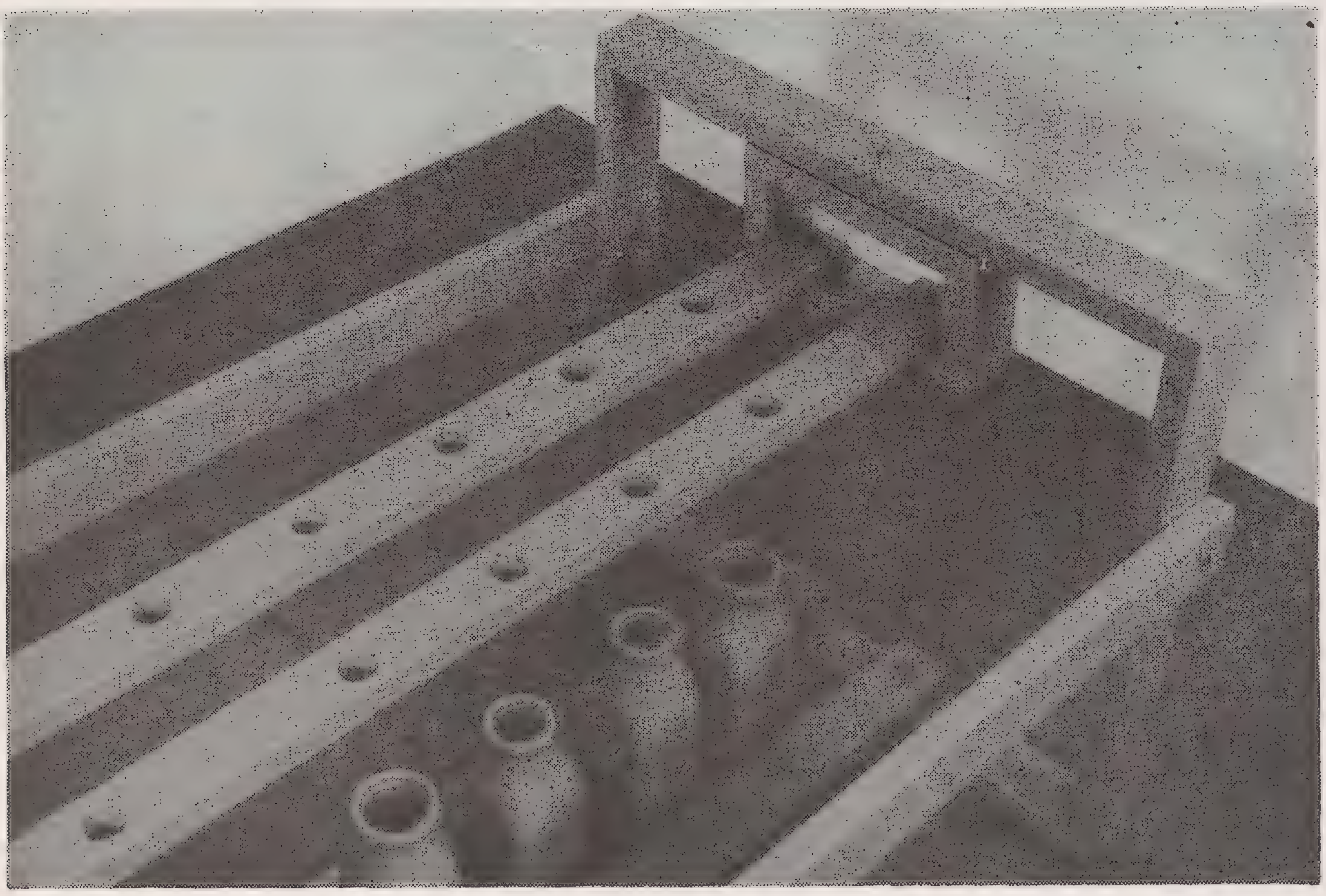

Fig. 24. Corliss rack for exhibiting flowers, showing auxiliary frame attached *below* on the end frame. Photo by Dr. Philip G. Corliss.

(5) The auxiliary frames are four inches high and six inches wide. They may be attached either below [Fig. 24] or above [Fig. 25] the end frames thus permitting a variation of height of the center strip from approximately 12 to 24 inches from the floor, as the center strip is placed either at the top of the auxiliary frames or in any intermediate position down to suspension from the bottom of the auxiliary frames.

(6) If the number of specimens is large, two center strips may be used. A major objection to the present staging of most flower shows is the crowding of the specimens which results in good view only of those in the front row of containers. The low position afforded by the rack

permits a better view of a double row of specimens than does the table.

(8) Accessory center (top) strips with holes of larger diameter may be used for flowers with thick stems such as amaryllis, gladiolus, and iris. The narrow holes are more suitable for hemerocallis, chrysanthemums, peonies, and climbing roses and other shrubs. Classes calling for three stems may employ three adjacent holes in the center strip with the stems going into the same container.

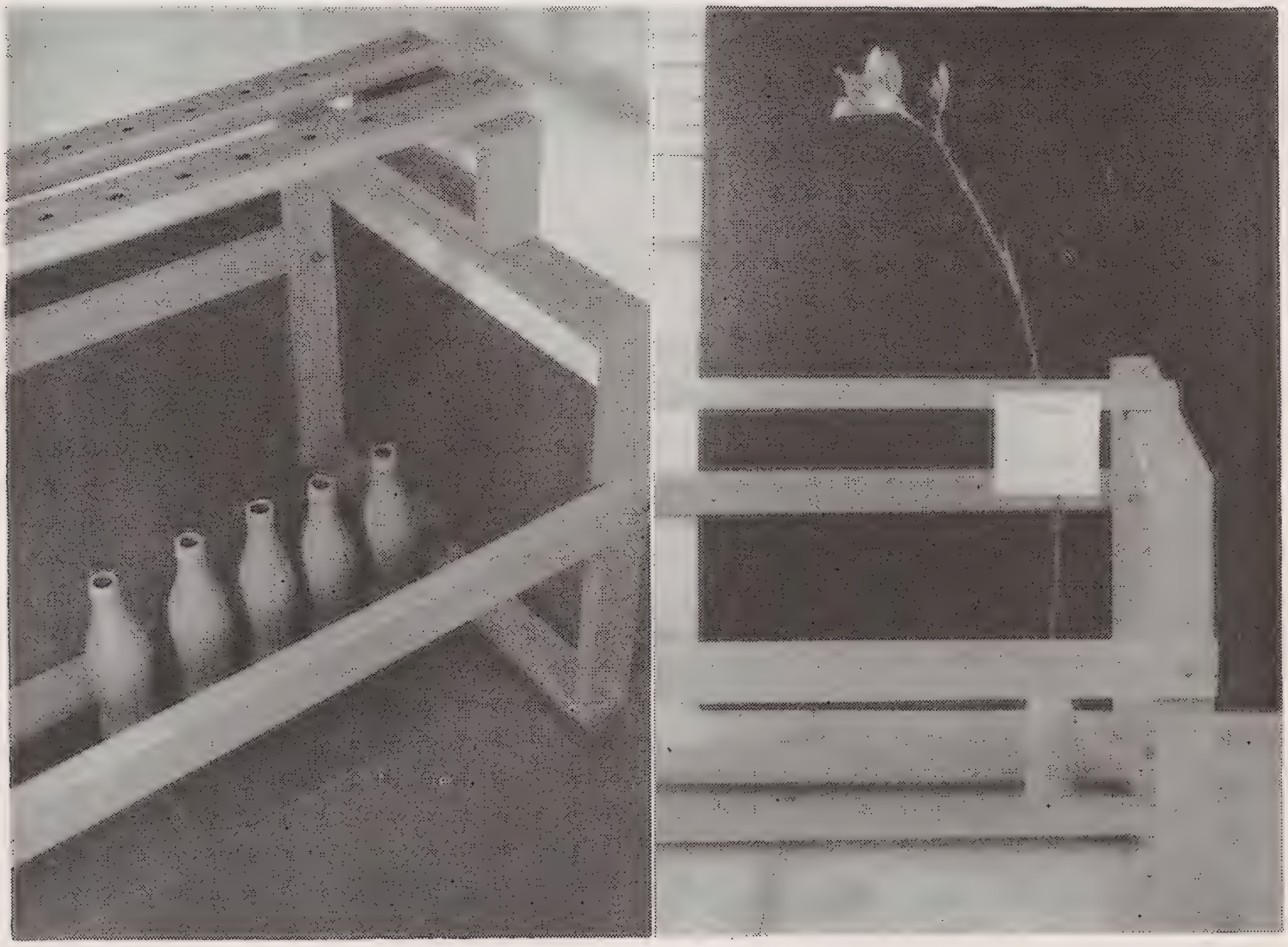

Fig. 25. Corliss rack for exhibiting flowers, showing (at left), auxiliary frame attached *above* the end frame; (at right), one end of the rack with Daylily flower scape in place. Photo by Dr. Philip G. Corliss.

(8) The rack AND all the containers should be painted with a color which provides pleasing harmony or contrast to the flower stems.

The Corliss Rack may be easily made by anyone. It is not more expensive than the usual cost of labor and covering material required for a single show, yet the racks may be stored and used for an indefinite number of shows. It is hoped that the widespread use of this rack, with improvements that will be made by those who work with it, will result in better shows staged at lower cost and less work by sponsoring groups.

DWARF THYME AS A GROUND COVER

HAMILTON P. TRAUB, *California*

The writer has long ago discarded the usual grass ground cover that needs to be mown often during the summer. He remembers the unwelcome lawn-mowing chore of his childhood that kept him only too often from taking part in the lively base ball game on the city green. As a substitute for the usual grass, he has been experimenting with various ground covers that require infrequent or no mowing. Some of these—Dichondra, Duchesnea, Hedera, and so on—are widely grown in California, but they have certain disadvantages. Dichondra for instance requires too frequent watering; Duchesnea is not always as sightly as it might be, and Hedera provides a heaven for billions of sowbugs, snails, slugs and so on. One of the interesting plants studied by the writer as a ground cover is the low growing *Thymus serphyllum.*

The writer's stock of the dwarf thyme has been grown from seeds obtained from an eastern dealer, but the seedlings show a very wide range from very low growing to several inches high. Apparently the seeds were a mixture of several species. Bailey (1949), in listing *Thymus serphyllum,* states that the species is exceedingly variable, and often is ''made to include many of those here treated as species.''

The writer has isolated various seedling clones that are maintained by vegetative propagation. The characteristics sought are low, compact growing habit, and deep green foliage. His experiments have been based on these numbered selections.

The main difficulty experienced with *Thymus serphyllum* as a ground cover is due to the fact that it blooms in July and August in California, and the flower heads must be clipped early before they set seeds. If clipped too late, the plants make a bare, unsightly appearance for a time before new growth appears. Thus it appeared that dwarf thyme was not a perfect ground cover that could be grown without mowing at least a few times each summer. However, some of the seedlings turned out to be sterile, and this may solve the mowing problem. In the cases of sterility observed, the flowers are borne on very short heads, but no seeds are set. The flower heads soon wither and the plants remain green during the entire flowering season, and also during the rest of the year. Selections Th-153 and Th-253 have been vegetatively propagated for the making of thorough trials.

It is still too early to reach a final conclusion about the value of the sterile dwarf clones as ground covers which do not require frequent mowing. Other progress reports will be published in later issues of Plant Life.

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Bailey, L. H. Manual of Cultivated Plants. Macmillan. 1949.

THE GENUS **IPHEION**: DIAGNOSIS, KEY TO SPECIES AND SYNONYMY

HAMILTON P. TRAUB AND HAROLD N. MOLDENKE

The species *Ipheion uniflorum* (Lindl.) Rafin., the type of the genus *Ipheion* Rafin., has had a checkered career. It has been assigned to no less than seven genera at one time or another,—*Triteleia, Ipheion, Milla, Brodiaea, Leucocoryne, Hookera* and *Beauverdia.* Its status was somewhat clarified when Hoover (1939; 1940; and 1941) published his revision of the North American relatives of *Ipheion uniflorum,* and also showed that these North American species belong mostly to the genera *Brodiaea, Dichelostemma* and *Triteleia.* Hoover pointed out that the genus *Triteleia* Douglas ex Lindl., was founded in 1830 on the basis of material from North America that was furnished to Lindley by Douglas: that three species were included (1) *T. bivalvis,* and (2) *T. uniflora,* both from South America, and (3) *T. grandiflora,* from North America; that, according to Lindley, the genus was "marked in Mr. Douglas' papers *Triteleia,* which we suspect is a name furnished to him by Dr. Hooker"; that the plant of Douglas naturally would be *T. grandiflora,* which he collected, rather than one of the South American species which Lindley added to the same genus. Thus it is clear that neither *I. uniflorum,* or *I. bivalve* could be the type of the genus *Triteleia.*

Beauverd (1908) presented an historical outline of the genus *Nothoscordum* Kunth. He classified the recognized species under two sections—Sect. *Uniflora* Beauv. (including among others, *Triteleia uniflora* Lindl.), and Sect. *Umbelliflorum* Beauv., centering around *N. bivalve.* Herter (1943) raised the sect. *Uniflorum* to generic rank under the name, *Beauverdia* Herter. Traub (1954) presented an emended diagnosis, a key to the species and the synonymy of the residual Sect. *Umbelliflorum* under the original generic name, *Nothoscordum* Kunth. Stearn (1943) pointed out that the name, *Ipheion* Rafin., (1837), with *Triteleia uniflora* Lindl., as the type, has priority over the name, *Beauverdia* Herter (1943). He accordingly restored the former generic name, and presented a detailed generic diagnosis. He also recognized five forms under *Ipheion uniflorum.*

Since descriptions in English are now available for all *Ipheion* species, the urgent needs for Plant Life readers are an emended diagnosis of the genus, a key to the 23 species, and their synonymy, which are presented in the present paper.

It should be noted that in the key, the species have been grouped under two sections—

2a. (of the key). Tepaltube very short, less than 4 mm. long; type: *I. bivalve* (Lindl.) Traub .... Section 1.
2b. (of the key). Tepaltube 4.5—39 mm. long; type: *I. uniflorum* (Lindl.) Rafin .... Section 2.

It should be noted that these two groups practically grade into each other, the campanulate perigone being usually associated with a short tepaltube (Sect. 1), and the longer flower shape with the relatively longer tepaltube, up to 39 mm. long (Sect. 2).

Genus IPHEION Rafin.

Fl. Tellur. II, 12. 1837; syn.—*Nothoscordum* sect. *Uniflorum* Beauv., in Bull. Herb. Boiss. (2) VIII, 1006. 1908; *Beauverdia* Herter, in Boissiera VII, 507. 1943.

Diagnosis.—Bulbous perennials with or without an alliaceaus smell; *bulb* with membranous tunics; *leaves* linear, narrowly linear, or narrowly lanceolate with nearly flat or flat surfaces, or canaliculate, rarely terete or filliform; *peduncle* leafless; *umbel* 1—8-flowered; *spathe* 2-valved, united for part of its length below, the valves linear, linear-lanceolate, lanceolate, elliptic-acuminate, elliptic-lanceolate, ovate-lanceolate, or ovate-lanceolate-acuminate; ovary sessile or pedicellate, the *pedicel,* if present, not articulated below the ovary; *flower* white, whitish. white-striped-violet, white keeled green or red, greenish-white, green, pale yellow, golden yellow, pale lilac, lilac or violet; *ovary* tri-locular, each *locule* with several *ovules; tepaltube* cylindric, funnel-shaped, obconic, sub-campanulate or campanulate, well-developed, 4.5—39 mm. long, or very short and less than 4 mm. long; *tepalsegs* 6, linear, narrowly-linear, lanceolate-acuminate, elliptic, elliptic-acute, lanceolate-spatulate, oblong-lanceolate, oblong-acute, oblong-spatulate, ovate-acute or rounded-spatulate; *stamens* 6, arranged in two series, rarely at one level, below the mouth on the inside of the tepaltube, or rarely near its mouth; *filaments* slender, filiform, filiform-flattened below, or subulate; *anthers* oblong, versatile; *style* filiform, or rarely thick and short; *stigma* minutely 3-lobed or capitate; *fruit* a trilocular capsule.

Systematic position: *Amaryllidaceae,* tribe *Allieae,* Hutchinson (1934), near *Nothoscordum* and *Tristagma.*

Distribution: twenty-three species in Uruguay, Argentina and Chile.

Type species: *Ipheion uniflorum* (Graham) Rafin., Fl. Tellur. II, 12. 1837. = *I. uniflorum* (Lindl.) Rafin.

KEY TO THE SPECIES OF **IPHEION**

- 1a. Tepaltube very short, less than 4 mm. long (Section 1. type: I. *bivalve* (Lindl.) Traub):
  - 2a. Perigone white, whitish-violet and whitish-violet nerved, or white, red-keeled, or violet:
    - 3a. Umbel 2—6-flowered:
      - 4a. Filaments linear, 6 mm. long, tepalsegs oblong-lanceolate (Chile) 1. *violaceum*
      - 4b. Filaments flattened downwards, 3 mm. long, tepalsegs oblong-spatulate (Chile) .... 2. *bivalve*
    - 3b. Umbel 1-flowered:
      - 5a. Pedicels 3-6 mm. long:
        - 6a. Filaments filiform (Argent.) .... 3. *setaceum*
        - 6b. Filaments subulate (Argent.) .... 4. *lloydiiflorum*
      - 5b. Pedicels 13—25 mm. long (Uruguay) .... 5. *vittatum*
  - 2b. Perigone golden yellow:
    - 7a. Pedicels 1—2 mm. long (Uruguay) .... 6. *hirtellum*
    - 7b. Pedicels 6—10 mm. long:
      - 8a. Tepalsegs 19 mm. long (Uruguay) .... 7. *felipponei*

8b. Tepalsegs 10—15 mm. long:
9a. Tepalsegs elliptic (Argent.) ....8. *lorentzii*
9b. Tepalsegs oblong-spathulate (Uruguay) ....9. *sellowianum*
1b. Tepaltube relatively longer, 4.5—39 mm. long (Section 2. type: *I. uniflorum* (Lindl.) Rafin.):
10a. Umbel 4—8-flowered:
11a. Filaments filiform (Chile) ....10. *poeppigianum*
11b. Filaments subulate (Chile) ....11. *porrifolium*
10b. Umbel 1—3-flowered:
12a. Leaves up to 1.5 mm. wide. (tepaltube 6—10 mm. long):
13a. Pedicels 12—18 mm. long (Argent.) ....12. *patagonicum*
13b. Pedicels 5—8 mm. long, or ovary sessile:
14a. Perigone 10—12 mm. long, ovary pedicellate:
15a. Tepalsegs linear (Argent.) ....13. *speggazinii*
15b. Tepalsegs oblong-spathulate (Uruguay & Argent.) ....14. *tweedianum*
14b. Perigone 18—20 mm. long, ovary sessile (Chile) ....15. *sessile*
12b. Leaves 2—12 mm. wide, (tepaltube 8—39 mm. long):
16a. Peduncle 2—30 cm. tall:
17a. Tepaltube 8—13.3 mm. long:
18a. Ovary pedicellate, pedicels 10—30 mm. long:
19a. Tepalsegs linear or narrowly-linear, leaves 2—3 mm. wide:
20a. Style filiform, 3 mm. long, flowers green (Chile) ....16. *nivale*
20b. Style rather thick, 3 mm. long, flowers greenish-white (argent.). 17. *ameghinoi*
19b. Tepalsegs oblong-lanceolate, leaves 5—12 mm. wide (Argent.) 18. *viridor*
18b. Ovary sessile (Argent.) ....19. *circinatum*
17b. Tepaltube 15—39 mm. long:
21a. Pedicels 25—51 mm. long:
Flowers pale lilac, lilac, violet or white, umbel 1—3-flowered (Argent.) 20. *uniflorum*
21b. Pedicels 1—11 mm. long:
22a. Umbel 2-flowered (Chile) ....21. *gracile*
22b. Umbel 1-flowered (Uruguay) ....22. *recurvifolium*
16b. Peduncle scarcely rising above the ground:
Umbel 1—3-flowered, flowers white, keeled green (Chile) ....23. *brevipes*

SPECIES NAMES AND SYNONYMY

1. IPHEION VIOLACEUM (Kunth) Traub, in Plant Life *9:* 69. 1953. Syn.—*Triteleia violacea* Kunth, Enum. Pl. *4:* 468. 1843; *Milla violacea* Baker, in Jour. Bot. Lond. 12: 5. 1874.

2. IPHEION BIVALVE (Lindl.) Traub, in Plant Life *9:* 69. 1953. Syn.—*Triteleia bivalvis* Lindl., in Bot. Reg. *15:* sub pl. 1293, in adnot. 1830; Kunth. Enum. Pl. *4:* 468. 1843; C. Gay, Fl. Chil. *6:* 117. 1853; *Triteleia gaudichaudiana* Kunth, Enum. Pl. *4:* 467. 1843; *Milla bivalvis* Baker, Jour. Linn. Soc. Bot. *11:* 386. 1871.

3. IPHEION SETACEUM (Baker) Traub, in Plant Life *9:* 69. 1953. Syn.—*Milla setacea* Baker, in Jour. Linn. Soc. Bot. *11:* 385. 1871.

4. IPHEION LLOYDIIFLORUM (Beauv.) Traub, in Plant Life *5:* 50. 1949. Syn.—*Nothoscordum lloydiiflorum* Beauv., in Bull. Herb. Boiss. ser. 2. *8:* 998, fig. 2. 1908; *Beauverdia lloydiiflora* (Beauv.) Herter, in Boissiera *7:* 510. 1943.

5. IPHEION VITTATUM (Griseb.) Traub, in Plant Life *5:* 50. 1949. Syn.—*Milla vittata* Griseb., in Goett. Abh. *24:* 318. 1879; *Brodiaea*

vittata Baker, in Gard. Chron. ser. 3, *20:* 459. 1896; *Beauverdia vittata* (Griseb.) Herter, in Boissiera *7:* 511, fig. 55, left. 1943.

6. Ipheion hirtellum (Kunth) Traub, in Plant Life *5:* 50. 1949. Syn.—*Triteleia hirtella* Kunth, Enum. Pl. *4:* 465. 1843; *Milla hirtella* (Kunth) Baker, in Jour. Linn. Soc. Bot. *11:* 385. 1871; *Brodiaea hirtella* (Kunth) Baker, in Gard. Chron. ser. 3, *20:* 459. 1896; *Nothoscordum canescens* Beauv., in Bull. Herb. Boiss. ser. 2. *8:* 997, fig. 1-A-D. 1908; *Nothoscordum subsessile* Beauv., in Bull. Herb. Boiss. ser. 2. *8:* 997, fig. 1-E-H. 1908; *Nothosocordum hirtellum* (Kunth) Herter, in Ind. Sem. Montev. 1928-1929; *Beauverdia hirtella* (Kunth) Herter, in Boissiera *7:* 509. 1943; *Beauverdia subsessilis* (Beauv.) Herter, in Boissiera *7:* 510. 1943; *Ipheion subsessile* (Beauv.) Traub, in Plant Life *5:* 50. 1949.

7. Ipheion felipponei (Beauv.) Traub, in Plant Life *5:* 50. 1949. Syn.—*Nothoscordum felipponei* Beauv., in Bull. Soc. Bot. Geneve, ser. 2. *13:* 267. 1921; *Brodiaea felipponei* (Beauv.) Herter, in Flor. Urug. *2:* 47. 1930.

8. Ipheion lorentzii (Herter) Traub, in Plant Life *5:* 50. 1949. Syn.—*Beauverdia lorentzii* Herter, in Boissiera *7:* 509, fig. 54. 1943.

9. Ipheion sellowianum (Kunth) Traub, in Plant Life *5:* 50. 1949. Syn.—*Triteleia sellowiana* Kunth, in Enum. Pl. *4:* 466. 1843; *Milla sellowiana* (Kunth) Baker, in Jour. Linn. Soc. Bot. *11:* 383. 1871; *Brodiaea sellowiana* (Kunth) Baker, in Gard. Chron. Lond. ser. 3, *20:* 459. 1896; *Nothoscordum ostensii* Beauv., in Bull. Herb. Boiss. ser. 2. *8:* 996, fig. 1-J-M. 1908; *Beauverdia sellowiana* (Kunth) Herter, in Boissiera *7:* 510. 1943.

10. Ipheion poeppigianum (C. Gay) Traub, in Plant Life *9:* 69. 1953. Syn.— *Triteleia poeppigiana* C. Gay, in Fl. Chil. *6:* 117. 1853; *Milla poeppigiana* (C. Gay) Baker, in Jour. Linn. Soc. Bot. *11:* 383. 1871; *Brodiaea poeppigiana* (C. Gay) Kurtz, in Bol. Acad. Nac. Cienc. Cordoba, *13:* 199, 202. 1893; Baker, in Gard. Chron. ser. 3, *20:* 459. 1896; Macloskie, in Rept. Princeton Univ. Exped. *8(1)* Bot.: 305. 1903—06.

11. Ipheion porrifolium (Poepp.) Traub, in Plant Life *9:* 69. 1953. Syn.—*Triteleia porrifolia* Poepp., in Fragm. synop. Pl. Phan. Chil. 10. 1833; Kunth, Enum. Pl. *4:* 468. 1843; Poepp. & Endl., Nov. Gen. et Sp. *2:* 28, pl. 139. 1835; C. Gay, Fl. Chil. *6:* 118. 1853; *Milla porrifolia* (Poepp.) Baker, in Jour. Linn. Soc. Bot. *11:* 386. 1871; Refug. Bot. *4:* pl. 258. 1871; Hooker, in Bot. Mag. Lond. *98:* pl. 5977. 1872; *Brodiaea porrifolia* (Poepp.) Meigen, in Engler, Bot. Jahrb. *17:* 225. 1893; Fuentes, in Bol. Mus. Nac. Chil. *12:* 110, fig. 2. 1929.

12. Ipheion patagonica (Baker) Traub, in Plant Life *9:* 69. 1953. Syn.—*Milla patagonica* Baker, in Jour. Linn. Soc. Bot. *11:* 383. 1871; *Brodiaea patagonica* (Baker) Baker, in Gard. Chron. ser. 3, *20:* 459. 1896.

13. Ipheion spegazzinii (Macloskie) Traub, in Plant Life *9:* 69. 1953. Syn.—*Brodiaea patagonica* Speg., in Rev. Facult. Agron. Vet. La Plata *3:* 576—577. 1897, err. 1896, non Baker, 1871 (cf. Speg. Pl. Pat. Austr. June 1897); type: Speg. no. 362; *Triteleia uniflora* Hier., Sert. Pat. fig. 53, no. 146, non Lindl., in part (cf. Speg. l. c. 1897), in synon.;

Triteleia patagonica (Speg.) Speg., in Nova Addenda ad floram Pat. III. no. 584. 1902 (type: Speg. no. 362, err. no. 366); *Brodiaea spegazzinii* Macloskie, in Rept. Princeton Univ. Exped. Pat. *8:* 305. 1903-06 (type: Speg. no. 362); *Brodiaea luzula* (Speg.) Macloskie, l. c., 1903-06 (type: Speg. no. 362, err. no. 366, cf. Hausman, in Physis 3: 423-426. 1917; Moldenke, in Plant Life *11:* 62-63. 1955; *Ipheion luzula* (Speg.) Traub, in Plant Life *9:* 69. 1953 (type: Speg. no. 362, err. no. 366).

14. IPHEION TWEEDIANUM (Griseb.) Traub, in Plant Life *5:* 50. 1949. Syn.—*Milla tweediana* Griseb., in Goett. Abh. *24:* 318. 1879; *Beauverdia tweediana* (Griseb.) Herter, in Boissiera *7:* 512, fig. 53. 1943.

15. IPHEION SESSILE (Phil.) Traub, in Plant Life *9:* 69. 1953. Syn.—*Triteleia sessilis* Phil., Linnaea *29:* 72. 1857—58; *Milla sessiliflora* Baker, in Jour. Linn. Soc. Bot. *11:* 382. 1871; *Brodiaea sessilis* (Phil.) Meigen, in Engler, Bot. Jahrb. *17:* 225. 1893; *Brodiaea sessiliflora* (Baker) Baker, in Gard. Chron. ser. 3, *20:* 459. Oct. 1896.

16. IPHEION NIVALE (Poepp.) Traub, in Plant Life *9:* 69. 1953. Syn.—*Tristagma nivalis* Poepp., in Poepp. & Endl. Nov. Gen et Sp. *2:* 28, pl. 140. 1835; C. Gay, in Fl. Chil. *6:* 125. 1853; *Milla nivalis* (Poepp.) Baker, in Jour. Linn. Soc. Bot. *11:* 383. 1871; *Brodiaea nivalis* (Poepp.) Baker, in Gard. Chron. ser. 3, *20:* 459. Oct. 1896.

17. IPHEION AMEGHINOI (Speg.) Traub, in Plant Life *9:* 69. 1953. Syn.—*Brodiaea ameghinoi* Speg., in Rev. Facult. Agron. Vet. La Plata *3:* 575—576. 1897, err. 1896.

18. IPHEION VIRIDOR (Killip) Traub, in Plant Life *9:* 69. 1953. Syn.—*Brodiaea viridor* Killip, in Jour. Wash. Acad. Sci. *16:* 566. 1926.

19. IPHEION CIRCINATUM (Sandwith) Traub, in Plant Life *9:* 69. 1953. Syn.—*Brodiaea circinata* Sandwith, in Hook. Ic. Pl. 5th. ser., *4:* pl. 3350. 1937.

20. IPHEION *uniflorum* (Lindl.) Rafin., in Fl. Tellur. II. 2. 1837; Stearn, in Gard. Chron. ii (1943) 60—61, fig. 32. Syn.—*Triteleia uniflora* Lindl., in Bot. Reg. Lond. *15:* sub pl. 1293, in nota. 1829; *23:* pl. 1921. 1837; Flore des Serres, *9:* pl. 967. 1854; *Milla uniflora* Graham, in Edinb. New Phil. Jour. *14:* 174-175. 1833; *Triteleia conspicua* Baker, in Saund. Bot. Refug. *1:* 61, pl. 43. 1868; *Milla bonariensis* Gillies ex Baker, in Lour. Linn. Soc. Bot. *11:* 382. 1871, in synon.; *Brodiaea uniflora* (Lindl.) Engl., in Engl. & Prantl Nat. Pflanzenfam. *2(5):* 57. 1887; Baker, in Gard. Chron. ser. 3, *20:* 459. Oct. 1896; *Leucocoryne uniflora* (Lindl.) Green (1890); *Hookera uniflora* (Lindl.) O. Kuntze (1891); *Beauverdia uniflora* (Lindl.) Herter, in Boissiera *7:* 512, fig. 55, right. 1943.

21. IPHEION GRACILE (Phil.) Traub, in Plant Life *9:* 69. 1953. Syn.—*Triteleia gracilis* Rhil., in Anal. Univ. Chil. 550. 1875; *Brodiaea philippiana* Baker, in Gard. Chron. ser. 3, *20:* 459. Oct. 1896; *Brodiaea gracilis* (Phil.) Fuentes, in Bol. Mus. Nac. Chil. *12:* 110. 1929.

22. IPHEION RECURVIFOLIUM (C. W. Right) Traub, in Plant Life *9:* 69. 1953. Syn.—*Brodiaea recurvifolia* C. H. Wright, in Bull. Misc. Inf. Kew. 117. 1915.

23. Ipheion brevipes (Kunze) Traub, in Plant Life *9:* 69. 1953. Syn.—*Triteleia brevipes* Kunze, in Linnaea *20:* 9. 1847; *Milla brevipes* (Kunze) Baker, in Jour. Linn. Soc. Bot. *11:* 386. 1871; *Milla leichtlinii* Baker, in Gard. Chron. Lond. i (1875) 234; Bot. Mag. Lond. 102: pl. 6236. 1876; *Brodiaea leichtlinii* (Baker) Baker, in Gard. Chron. ser. 3, *20:* 459. Oct. 1896.

DOUBTFUL SPECIES

Triteleia graminifolia (Bert.) Presl, in Abh. Boehm. Ges. Wiss. V. *3:* 116. 1844. According to Presl, *Bulbocodium graminifolium* Bert., native to Chile, belongs in the genus *Triteleia*. If this species can be authenticated, it will apparently come either under *Nothoscordum* Kunth or *Ipheion* Rafin.

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OUTLINE — GARDENING PROGRAM IN THE CLEVELAND PUBLIC SCHOOLS

[The following outline was written by Paul R. Young, Supervisor of School Gardens, Cleveland Public Schools. It is published so that it may be available generally for use in public schools.—*Editor*]

The Division of School Gardens is an Auxiliary Agency in the Cleveland School System. It exists to aid teachers and pupils in the conduct of educationally desirable and effective experiences in gardening. Its program toward that end is set forth in this outline.

A. REGULAR SCIENCE COURSE-OF-STUDY UNITS IN GARDENING

(Prepared by Garden Division, and serviced with teaching materials.)

Grade III. How Can We Plant and Grow a Beginner's Garden?
Grade IV. How Can We Make a Garden?
Grade V. How Can We Have a Successful Garden Exhibit?
Grade VI. How Can We Take Care of a Small Garden?
Grade VII. Gardening, Why, Where, How?
Grade VIII. Gardening for Home Improvement.
Grade IX. Gardening—Plants in the Service of Man.

B. VOLUNTARY PROJECT PROGRAM IN GARDENING

Following is an outline of the projects in gardening made available, on a voluntary basis, to teachers and pupils in the schools. Each school decides whether or not it wishes to participate, and requests the projects desired, on blanks furnished at the appropriate times by the Garden Division. Supplies are delivered to the schools, and are furnished without cost (up to a reasonable maximum) for most of the school projects. Pupils pay an enrollment fee for the individual home projects, to cover the cost of seeds, fertilizer, plants, etc., furnished them through the schools. Outlines of information and suggestions for teachers are provided for each project, by the Garden Division.

Kindergarten. SEED SOWING AND PLANT GROWING; CORN: Seeds, soil, individual plant bands, and plantrays to hold them, are furnished for each child to plant and grow his own plant. A *classroom* project.

Grade I. SEED SOWING AND PLANT GROWING; SUNFLOWERS: Similar to the kindergarten project, using sunflower seeds instead of corn. A *classroom* project.

Grade II. SEED SOWING AND PLANT GROWING; TOMATOES: Similar to the kindergarten project, using tomato seeds instead of corn. A *classroom* project.

Grade III. GROWING PAPER WHITE NARCISSUS IN BOWLS: Bulbs, gravel, and bowls are provided, sufficient to allow each participating class to plant 8 bowls of 3 paper white narcissus, to be brought into flower in the school. A *classroom* project. BEGINNER'S GARDENS: Small children's gardens (4 by 5 feet) for which a plan, seeds, plants, and onion sets are furnished for a nominal enrollment fee, paid by children who wish to enroll. An *individual home* project supervised by one home visit during the summer.

Grade IV. CARING FOR PLANTS IN THE SCHOOL: An educational project in caring for plants purchased for decorative purposes in the school. (See section C, Service Projects, on the next page of this outline.) A *school* and *classroom* project. HOUSE PLANTS FOR THE HOME: Rooted English ivy cuttings, pots, and soil are provided so that each pupil in participating classes can pot an ivy plant to take home. A *classroom* project. HOME GARDEN PROJECTS, REGULAR SERIES: Vegetable and flower gardens planned for children, with seeds, plants, and fertilizer furnished to pupils who pay the small enrollment fee. *Individual home* projects, supervised by two home visits during the summer.

Grade V. POTTING BULBS FOR SPRING BLOOM: Pots, soil, and bulbs are provided sufficient to plant two pots of tulips and two of daffodils, for each class above the primary division. Extra bulbs and pots (including hyacinths) can be purchased at cost, to extend this project. Potted bulbs are stored at school garden centers, for rooting during winter, and taken back to the schools in early spring. A *classroom* project. BULBS FOR HOME FLOWERING: Pupils may enroll and for a small fee receive a bowl of gravel and 3 paper white narcissus bulbs for flowering at home. An *individual home* project. (Also available to Grade VI.) HOME GARDEN PROJECTS, REGULAR SERIES: As described for Grade IV. *Individual home* projects, supervised by two home visits during the summer.

Grade VI. MAKING NEW PLANTS FROM SOFTWOOD CUTTINGS: Cutting stock, boxes and sand, pots, and soil are provided to allow each pupil in participating classes to make several cuttings, and pot them for taking home, after they are rooted. A *classroom* project. HOME GARDEN PROJECTS, REGULAR SERIES: As described for Grade IV. *Individual home* projects, supervised by two home visits during the summer.

Grades VII through XII. HOME GARDEN PROJECTS, REGULAR SERIES, PLUS SPECIAL PROJECTS WITH CHRYSANTHEMUMS, GLADIOLUS, AND ROSES: As described for Grade IV. *Individual home* projects, supervised by two home visits during the summer. POTTING BULBS FOR SPRING BLOOM: Bulbs, pots, soil, etc., furnished for junior and senior high science class potting, as for Grade V. A *classroom* project. SPECIAL TECHNICAL, OCCUPATIONAL, AND AVOCATIONAL COURSES IN HORTICULTURE: At West Technical High School, Thomas Edison Occupational School, Benjamin Franklin School Garden, Memorial School Garden, and Harvey Rice School Garden, horticulture courses for secondary pupils are offered.

All Grades. SCHOOL GARDEN TRACTS: At 6 school garden centers individual garden plot projects are made available to pupils ranging from kindergarten through high school. For a nominal fee pupils may enroll and be assigned a plot; work is done under teacher direction on an all-summer schedule, except for kindergarten and primary gardeners, whose work ends with the school semester. All produce belongs to the pupils. These centers are operated in conjunction with the following schools but pupils from other accessible schools participate: BENJAMIN FRANKLIN, HARVEY RICE, H. W. LONGFELLOW, KENTUCKY, MILES, and WADE PARK.

C. SPECIAL SERVICE PROJECTS FOR SCHOOLS, TEACHERS, AND PUPILS

Plants for School Decoration. Principals are privileged to order specified plants useful and feasible for school conditions, at cost prices. Plants are purchased in small sizes in spring, grown on at Garden Division Greenhouses (WEST TECH) and delivered to schools after opening of fall semester.

Teacher Workshops. A series of 4 or 5 practical projects in gardening is made available to all teachers and other school personnel, each school year. Material costs are borne by participants. East and West side groups; meet Saturday mornings, for the most part.

Christmas Decorations. Supplies for desirable Christmas corsages, table pieces, and/or door swags are offered as pupil projects for the Holiday Season. Pupils pay enrollment fees to cover costs of materials. Work is done in classroom groups.

School Yard Planting. A number of the teaching staff of the Garden Division is assigned to the development of school yard improvement projects on an educational basis, in cooperation with principals, teachers and pupils, and with the Business Department. This service is rendered on request to the Garden Division office, in the order in which requests are received, and as rapidly as projects can be handled, utilizing both the spring and fall planting seasons.

D. CLASSES FOR ADULTS

A program of classes in gardening, and flower arrangement, is carried on at various school garden centers, in cooperation with the Division of Adult Education. A fall semester and a spring semester, of 10 weeks each, are offered. Classes meet in the evening, with the exception of one or two afternoon groups in flower arrangement. Regular fees are charged, in accordance with the schedule for other adult classes. Garden Division teachers are in charge.

One or more of these classes are offered at the following gardens: BENJAMIN FRANKLIN, HARVEY RICE, MEMORIAL, and WEST TECH Greenhouse.

[See also article, ''Gardening in the Cleveland Public Schools,'' by John F. Cooke, Jr., which appears in 1955 Herbertia.—*Editor*]

PLANT LIFE LIBRARY

PLANT GROWTH SUBSTANCES, by L. J. Audus. Interscience Publ., 250 5th Av., New York. 1953. pp. 465. $6.50.

This comprehensive manual on plant growth regulating substances was written "for all classes of reader, for the non-scientific layman who spends his week-ends in his garden as well as the agriculturist, the chemist and plant physiologist who are more directly concerned with the production and use of these chemicals." Dr. Audus has achieved a proper balance between the presentation of theoretical principles and practice since "an attempt has been made to cover every practical aspect of growth substance application yet . . . only the briefest of references [are] made to ultimate details of technique, rates of application, etc." The subjects treated include (1) the nature of plant growth and its control, (2) the nature of auxins, (3) the chemistry of auxins—natural and synthetic, (4) auxins as general growth stimulants, (5) use of auxins in rooting of cuttings, grafting and wound healing; as initiators and stimulators of fruit development, (6) use of auxins as growth inhibitors—induced dormancy, selective weed killers, (7) auxins and tissue differentiation, (8) applications of auxins in fruit ripening, initiation of flowering, prolonging of flower blooming, use in blossom thinning, relation to bolting in vegetables, crotch-angle strengthening in fruit trees, (9) hormones and reproduction, (10) specific factors for the growth of organs, (11) natural growth inhibitors, and (12) growth substance in soil. There are a glossary of terms, and appendices on responses of cuttings to auxin treatment; auxins and fruit setting in tomatoes, and other fruits; hormone herbicides, and hormones and the preharvest drop in apples; an excellent bibliography, and index.

Dr. Audus is to be congratulated in producing a most valuable synthesis of the vast data on this subject reported in the literature, including his own researches and those of his students. This is positively a book that all who are in any way concerned with plant growth regulators must have, including the intelligent layman gardeners, the agriculturists as well as the scientific workers.

PLANT REGULATORS IN AGRICULTURE, by H. B. Tukey, Editor. John Wiley & Sons. 440 4th Av., New York. 1954. pp. 269. $5.50.

The broad term, plant regulators, as defined in this book, includes both the plant hormones and other—usually synthetic—regulators that have been found useful in present day agriculture. This book by 17 authorities in the field of plant regulators has been "prepared for the many who have been puzzled . . . at their seeming inability to grasp the significance of plant regulators, what they are, how they operate, and where they belong in agriculture." It "is not intended as a handbook of recommended practices, but rather to provide background material, particularly for county agricultural agents, advanced high school students, college students and interested business and professional workers." It is indicated that due to space limitations, "It has been necessary to omit much excellent material" and "general statements have been resorted to in the interests of clarity and brevity," but enough of the basic facts are presented "for the reader to build upon." There is a real need for such an introductory book, and the authors of the 16 rather brief chapters have succeeded in giving an adequate outline of the subject matter concerning plant regulators. It is therefore required reading for all who are interested in this field.

OUTLINES OF ENZYME CHEMISTRY, by J. B. Neilands, P. K. Stumpf, and R. Y. Staner. John Wiley & Sons, 440 Fourth Av., New York. 1955. pp. 315. illus. $6.50.

This concise treatise was written "to introduce senior undergraduate and beginning graduate students to the general subject of enzyme chemistry, and to provide background material for research workers in fields other than enzymology." The subject is treated in "outline form so that the reader may acquire a clear and useful understanding of enzyme chemistry as a whole." The four parts of the book are devoted to (1) general principles, (2) physical chemistry of enzymes, (3) types of coenzymes and enzymes, and (4) metabolic patterns. This clearly written text is highly recommended.

ELEMENTS OF ECOLOGY, by George L. Clarke. John Wiley & Sons, 440 4th Av., New York. 1954. pp. 534. Illus. $7.50.

Although this introductory book on ecology was "written primarily for students of ecology," it also presents background material for "those interested in conservation, forestry, agriculture, fisheries, wildlife management and other branches of applied ecology." It stresses the "unity of ecology and the necessity for including the influences of both plants and animals as well as the physical forces as part of the environment." In the presentation, the "principal factors of the physical environment, such as water, temperature and light, are treated individually before their combined action is discussed." This excellent, easily readable text is very highly recommended.

THE PRACTICE OF SILVICULTURE, by R. C. Hawley and D. M. Smith. 6th ed. John Wiley & Sons, 440 4th Av., New York. 1954. pp. 525. Illus. $7.50.

This completely rewritten and greatly expanded 6th edition of a standard book on silviculture gives "expression to new knowledge and modern interpretations of old principles," and is intended primarily for use in forestry schools in the United States and Canada. The subjects covered include reproduction methods, the clearcutting method, seed-tree method, shelterwood method, selection method, vegetative reproduction methods, artificial reproduction methods, slash disposal and salvage cuttings, pruning and methods of controlling cuttings. This excellent text is indispensable to all students and workers in forestry.

GEOGRAPHY OF NORTH AMERICA, by G. J. Miller, A. E. Parkins and Bert Hudgins. 3rd ed. John Wiley & Sons, 440 4th Av., New York. pp. 664. Illus. 1950. $7.50.

Since this 3rd edition of a standard work is designed as a basic textbook, the authors' purpose is to present only the more general and basic materials, leaving the more detailed presentation and study to the instructor and student. The central theme of the book is the occupation of the North American continent by immigrants, the utilization of the available resources by the newcomers, the opportunities that are still available to them, and what effect the utilization of the resources had had on their social, political and economic life. The four parts of the book are concerned with (1) the North American Continent, (2) the United States and Alaska, (3) Canada, and (4) Mexico and Middle America. This easily readable book is highly recommended.

A PRACTICAL MANUAL OF MEDICAL AND BIOLOGICAL STAINING TECHNIQUES, by Edward Gurr. Interscience Publ., 250 5th Av., New York. 1954. pp. 320. $4.00.

This book has been written as ''a practical manual dealing with . . . most branches of microscope staining, entirely divorced from theory and general statements,'' and is intended to serve as a useful supplement to the standard works in the field of biology. The six sections are devoted to (1) fixation, dehydration, clearing, embedding, sectioning, etc., (2) animal histology, (3) botanical methods, (4) cytological methods, (5) fluorescence methods, and (6) smear preparations. Formulae, conversion tables, etc., are presented in the Appendix. The index is ample. This outstanding book is indispensable to those interested in microscope staining techniques.

TAXONOMIC TERMINOLOGY OF THE HIGHER PLANTS, by H. I. Featherly. Iowa State College Press. Ames, Ia. 1954. pp. 166. $3.75.

This concise reference book was written for students of taxonomy, plant distribution, and speciation, especially of the higher plants—Pteridophyta and Spermatophyta. About half of the book is devoted to a glossary of terms which according to the author is considered ''ample but intentionally not exhaustive . . . obsolete and seldom used words have been omitted purposely.'' In addition there are sections on (1) subject classification, (2) specific epithets with their meanings, (3) Greek and Latin components of specific words, (4) floral evolution and laws, theories having direct or indirect bearing on taxonomy, distribution or speciation; and (5) bibliography.

THE PHILOSOPHY OF SCIENCE, by Stephen Toulmin. Longmans, Green & Co. 55 5th Ave., New York. 1953. pp. 176. illus. Text ed. $1.80; Trade ed. $2.40.

This concise text is in the nature of an introduction to the philosophy of science. Although it is intended primarily for university students in philosophy, assuming ''no special knowledge either of mathematics or of natural science,'' the author hopes that the book will also interest the general reader. In the brief introduction it is indicated that the student needs ''an introductory guide to the types of argument and method scientists employ in actual practice.'' This need is supplied in the following chapters on discovery, laws of nature, theories and maps, and uniformity and determinism. There is also a list for suggested reading, and an index. This stimulating book is highly recommended.

PLANT BREEDING FOR EVERYONE, by John Y. Beaty. Chas. T. Brantford Co., Boston 16, Mass. 1954. pp. 102. Illus. $2.75.

The twenty very brief chapters of this little practical manual were written by a layman for the layman. In the first part of the book, the selection, testing, naming and patenting of new varieties is presented. In the remaining chapters plant hybridization, bud selection and inheritance of characters are briefly considered.

DAYLILIES AND HOW TO GROW THEM, by Ben A. Davis. Tupper & Love. Atlanta, Ga. 1954. pp. 149. Illus. $3.50.

This is a popular book on daylilies. The 22 brief chapters are concerned with hybridization, propagation, culture, and diseases of the daylily. In addition there are regional chapters by other writers.

THE CULTIVATION OF ANIMAL AND PLANT CELLS, by Philip R. White. Ronald Press, 15 E. 26th St., New York. 1954. pp. 239. Illus. $6.00.

Written by an eminent authority primarily for the non-specialist, this handbook on the technique of cultivating plant and animal tissues and cells outside the body will be welcomed by investigators, teachers, students and the layman. The nine chapters are concerned with the cell versus the organism, the history of cell culture, the living material, the laboratory, nutrients, types of cultures, setting up cultures, growth measurements and their interpretations and applications. Some simple techniques for beginners, and a bibliography are presented in the Appendix. The names and subjects indices are adequate. This concise, easily readable handbook is highly recommended.

ASPECTS OF DEEP SEA BIOLOGY, by N. B. Marshall. Philosophical Library, 15 E. 40th St., New York. 1954. pp. 380. Illus. $10.00.

According to the author, it is the purpose in this book to ''utilize present knowledge on deep sea biology and my own unpublished work to build up, chapter by chapter, an integrated account of life in deep oceanic waters.'' The 13 chapters are devoted to the growth of deep sea biology, means of exploring the ocean, the deep sea environment, oceanic plants, animal life in the deep sea, deep sea food chains, vertical patterns and mid-water life, counteracting gravity, sense organs of deep sea fishes, deep sea sound, living light in the deep sea, life histories, and some aspects of marine biogeography. This excellent book is highly recommended.

PLANT LIFE IN MALAYA, by R. E. Holttum. Longmans, Green & Co., 55th 5th Av., New York. 1954. pp. 254. Illus. $3.00.

The choice of plant material included in this popular book reflects the author's personal interests and emphasizes those plants of which he has special knowledge over a 30 year period. The subjects covered include trees, palms, pandans and tree ferns, bamboo, ginger and orchids, yams and other tubers, vegetative propagation, flowers and hybrids, fruits and seeds, bananas, grasses, the Pigeon Orchid, nest ferns and neighbors, terrestial ferns, climbing plants, parasites and saprophytes, water plants, plants and ants, and the Malaya forest. This interesting pioneering book is highly recommended.

[PLANT LIFE LIBRARY, continued on page 63.]

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

I. THE AMERICAN AMARYLLIS SOCIETY

[Affiliated with the American Plant Life Society]

[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

(c) REGISTRATION OF PLANT NAMES

Registrars: Dr. J. B. S. Norton, and Prof. W. R. Ballard.

Correspondence about the registration of plant names should be sent directly to Dr. Norton, *4922 40th Place, Hyattsville, Maryland,* and a self-addressed, stamped envelope should be enclosed if a reply is expected.

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FLOWER TYPES AND SCORE CARD FOR HYBRID AMARYLLIS

For classification of flower types of Hybrid Amaryllis see PLANT LIFE (HERBERTIA) 10: 23-30. 1954. For SCORE CARD see PLANT LIFE (HERBERTIA) 1950, pp. 45-46 (for "Elegans" read "Belladonna").

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Mr. John E. Voight, RFD One, Box 76, Hales Corners, Wisc., in charge of Daylily Trial Garden, at The Botanical Gardens, Whitnall Park.

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Note: Introducers of new daylily clones should send plants directly to the Trial gardens for testing. As soon as practical each trial garden will publish, in HERBERTIA, lists of the 10, 25, 50 and 100 best daylilies, on the basis of the clones tested, for the climatic region in which it is located.

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III. PUBLICATIONS OF THE AMERICAN PLANT LIFE SOCIETY

BOOKS

1. AMARYLLIDACEAE: TRIBE AMARYLLEAE, by Traub & Moldenke (including the genera Amaryllis, Lycoris, Worsleya, Lepidopharynx, Placea, Griffinia, and Ungernia; Manila covers; 194 pages, incl. 18 illustrations. $4.00 postpaid.

This is required reading for every amaryllid enthusiast.

2. DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948, by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila covers; 100 pages (I—X; 1—90), including a portrait of George Yeld. $1.50 postpaid.

PERIODICALS

(A) **HERBERTIA [First series,** 1934 to 1948, incl.], devoted exclusively to the amaryllids (Amaryllidaceae), and the workers concerned in their advancement. A complete set of these volumes is indispensable to all who are interested in the amaryllids. Libraries should note that this is the last opportunity for complete sets.

Volume 1 (1934). Dedicated to **Henry Nehrling.** Containing the biography of Henry Nehrling, and many valuable articles on amaryllis; with a portrait of Henry Nehrling and 16 other illustrations; a total of 101 pages.

Volume 2 (1935). Dedicated to **Theodore L. Mead.** Containing the autobiography of Theodore L. Mead, and many excellent articles on varieties, breeding, propagation, and culture of amaryllids; with portraits of Theodore L. Mead and David Griffith and 18 other illustrations; a total of 151 pages.

Volume 3 (1936). Dedicated to **Arthington Worsley.** Containing the autobiography of Arlington Worsley, and important articles on description, genetics and breeding, physiology of reproduction, and amaryllid culture; with 3 portraits of Arlington Worsley, one color plate, and 30 other illustrations; a total of 151 pages.

Volume 4 (1937). First British Edition. Dedicated to William Herbert. Containing the biography of William Herbert; the reprint of Herbert's essay, "On Crosses and Hybrid Intermixtures in Vegetables"; Dr. Darlington's essay, "The Early Hybridizers and the Origins of Genetics," and many important articles on description; cytology, genetics and breeding; physiology of reproduction, and amaryllid culture; with two portraits, forty-four other plates and three figures; a total of 280 pages.

Volume 5 (1938). First Netherlands Edition. Dedicated to Ernst H. Krelage. Containing the autogiography of Ernst H. Krelage; the history of amaryllid culture in Holland by Ernst H. Krelage, Dr. Uphof's important article in which the name Hippeastrum is rejected; a revision of the tribes of the Amaryllidaceae; and the species of Amaryllis; outstanding articles on forcing amaryllis by Dr. Grainger and Prof. Dr. van Slogteren; and many other articles on description, cytology, genetics and breeding; physiology of reproduction, and amaryllid culture; with 33 plates and 2 figures; a total of 218 pages.

Volume 6 (1939). Dedicated to the Union of **South Africa,** and containing articles on South African amaryllids, including the history of botanical exploration for amaryllids in South Africa, the distribution of South African amaryllids in relation to rainfall, and a review of the genus Agapanthus by Frances M. Leighton, a review of the Genus Cyrtanthus, with many excellent line drawings, by Dr. R. A. Dyer; other articles—Zephyranthes of the West Indies by Dr. Hume; the Tribe Gilliesieae by Dr. Hutchinson; rating of daylilies for garden value by Mr. Kelso; daffodil articles by Jan de Graaff, and many other items on description, cytology, breeding, propagation, and amaryllid culture; with 44 plates and 10 figures; a total of 258 pages.

Volume 7 (1940). Dedicated to **Latin America,** and featuring articles on Latin American amaryllids; biographies of Drs. Philippi and Holmberg; report by Dr. Goodspeed on the amaryllids collected by the Univ. of Calif., Second Andean Expedition; reports on the flowering of the "Blue Amaryllis," A. procera; and many other important articles on the description, propagation, breeding, culture, harvesting and storage of amaryllids. Of special interest are the important articles on the description, breeding and culture of daylilies by noted authorities. With 45 illustrations—30 plates and 15 figures—and a total of 242 pages.

Volume 8 (1941). First Daylily Edition. The first extensive symposium on the daylily, containing biographies of George Yeld, Amos Perry, Hans Sass, and Paul Cook, and important articles on daylily evaluation, breeding, propagation and culture. Also important articles on Narcissus and other amaryllids. Thirty-eight illustrations—27 plates and 11 figures—and a total of 185 pages.

Volume 9 (1942). First Alstroemerid Edition. Dedication to Harry L. Stinson, the outstanding authority on this plant group, who contributes a summary of his work on Alstroemerid taxonomy, breeding, propagation and culture. This volume contains the autobiography of Prof. Dr. Abilio Fernandes, the Check-List of Amaryllids by Major Pam, and a review of the species of Crinum by Dr. Uphof, and also many important articles on daylilies, Narcissus, Cyrtanthus, hybrid Amaryllis, Ixiolirion and other amaryllids. Thirty-five illustrations—17 plates and 18 figures—and a total of 243 pages.

Volume 10 (1943). 10th Anniversary Edition. Dedicated to Elizabeth Lawrence, the outstanding authority on the use of amaryllids in the garden, who contributes a summary of her work in this field. This volume contains the review of Agapanthus and Tulbaghia, by Dr. Uphof; and article on Brunsvigia rosea and hybrids by Mr. Hannibal; a symposium on Narcissus breeding by Messrs. Powell, Reinelt, Berry and Reynolds; a review of amaryllid chromosomes by Dr. Flory; articles on hybrid amaryllis, daylilies, and many other important articles on amaryllids. Forty-one illustrations—12 plates and 29 text figures—and a total of 205 pages.

Volume 11 (1944). First Allieae Edition. Dedicated to Dr. Henry A. Jones, the eminent American authority on the onion. This is one of the most outstanding issues up to the present for its record making contributions on the systematics of Allium by British authorities, and on onion breeding, propagation, and culture by American authorities. It contains Mr. Airy Shaw's translation of Vvedensky's Allinus of the Soviet Union; Stern's essay on the onion in the Old World and other articles; and articles on onion breeding, propagation and culture by Dr. Jones and his colleagues. There are also important contributions on ornamental Alliums for North America, and Allieae of North America. There are excellent articles on hybrid Amaryllis, Daylilies and various other amaryllids. Forty-three illustrations—25 plates and 18 text figures—and a total of 369 pages.

Volume 12 (1945). First Educational Edition. Dedicated to Supt. R. C. Huey, a pioneer in the use of amaryllids as an educational tool. This volume contains a brief autobiography by Supt. Huey, and an article by him on the use of amaryllids in teaching plant science; the announcement by Mulford B. Foster of the reintroduction of the sweet-scented Alstroemeria caryophyllaea, and an article by Harry L. Stinson on the true Alstroemeria Ligtu. This issue also contains an article on the origin of Tapeinanthus humilis by A. & R. Fernandes; important articles on Narcissus breeding; Leucocoryne and related genera; articles on various other amaryllids, including valuable contributions on Hemerocallis description and appreciation, breeding, culture, and packing daylily plants for shipping. Twenty-four illustrations—15 plates and 10 text figures—a total of 180 pages.

Volume 13 (1946). First Narcissus Edition. Dedicated to Guy L. Wilson, the noted Narcissus breeder. This volume contains an autobiography of Mr. Wilson, an article on his breeding activities; an article on Narcissus breeding in Australia by Mr. Alston; articles by American Narcissus breeders, including Frank Reinelt, E. P. Powell, J. S. Cooley, C. W. Culpepper and W. R. Ballard; an article on the karyology of the subgenus Ajax of the genus Narcissus by A. and R. Fernandes; a list of parents of hybrid Narcissus by Arno H. Bowers; Narcissus diseases by C. J. Gould; Narcissus insects and mites by E. P. Breakey; Narcissus culture by various authors. There are also articles on other amaryllids—Hemerocallis, hybrid Amaryllis, Habranthus, Crinums, Lapagerias, Agapanthus, Hymenocallis, etc. Thirty-nine illustrations—186 pages.

Volume 14 (1947). 2nd Hemerocallis Edition. Dedicated to Ralph W. Wheeler, the noted Daylily breeder. This volume contains an autobiography of Mr. Wheeler and an article on his breeding activities; and many important articles on Hemerocallis description, evaluation, breeding, etc., from various parts of the country. There are also important articles on other amaryllis—Hybrid Amaryllis, amaryllids in the Holy Land and Mexico, starch in Alstroemeria, the Galantheae, Double Narcissus, Zephyranthes, Sternbergia, Allium, etc. Twenty-eight illustrations—206 pages.

Volume 15 (1948). 2nd South African Edition. Dedicated to Dr. R. A. Dyer. This volume contains an autobiography of Dr. Dyer and two amaryllid articles by him, and other articles on South African amaryllids. There are also important articles on Hemerocallis, Amaryllis, Crinum, Narcissus, Brodiaea Lilies, Alstroemerias and other amaryllids by various authors. Forty-one illustrations—177 pages.

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A limited number of volumes of **Plant Life**, including **Herbertia**, second series, are available, all quotations subject to prior sale.

Vol. 1 (Nos. 1—3). 1945. Symposium on **Narcissus** breeding by various authors. **First Bromeliaceae Edition.** Profusely illustrated symposium on the bromels by Dr. Lyman B. Smith, Mulford B. and Racine Foster, David Barry, Jr., Ladislaus Cutak, and Wyndham Hayward. **25 illustrations—105 pages.**

Vol. 2 (Nos. 1—3). 1946. **Verbenaceae Edition.** Illustrated treatise on the Verbena Family by Dr. and Mrs. Moldenke, the outstanding authorities on this plant family. 9 illustrations—100 pages.

Vol. 3 (Nos. 1—3). 1947. **General Edition.** Containing an illustrated article on winter and spring flowering Gladiolus by W. M. James, and articles on the Dutch Bulb Industry by Dr. A. J. Verhage and J. F. Ch. Dix. 10 illustrations—42 pages

Vol. 4 (Nos. 1—3). 1948. **Aroid Lily Edition.** An illustrated treatise primarily on the genus Zantedeschia (Aroid Lily) containing articles by Hamilton P. Traub, A. A. Longmire, Fred M. Danks, H. M. Butterfield, Wyndham Hayward and Len Mirzwick. 11 illustrations—48 pages.

Vol. 5 (Nos. 1—4) 1949. 34 illustrations, a total of 134 pages.

Gesneriaceae Edition, with important articles on the subject by F. E. Smith, W. Hayward and the Moshers.

1949 HERBERTIA Edition, devoted exclusively to the amaryllids; the **First Australian Edition**, dedicated to Capt. C. O. Fairbairn, with biographies of Australian amaryllid pioneers, and articles on Australian amaryllids, South African amaryllids, the Pink Amaryllis, **A. belladonna** var. **Haywardii**, with illustration, hybrid Amaryllis breeding in South Australia by E. Both, Narcissus culture by Dr. Cooley, Mr. Mitsch and Mr. Ballard, and also important articles on other amaryllids.

Vol. 6 (Nos. 1—4) 1950. 47 illustrations, a total of 162 pages.

1950 HERBERTIA Edition, devoted exclusively to the amaryllids; the Hybrid Amaryllis Edition; dedicated to Mrs. Mary G. Henry, containing Mrs. Henry's autobiography; articles on Collection Amaryllids in South America by M. B. Foster; Amaryllis flower types; double Amaryllis; Amaryllis of To-morrow, by W. Hayward, and other articles on hybrid Amaryllis, Hemerocallis, Cyrtanthus, Blue Amaryllis, South African Amaryllids, Review of the genus Brunsvigia (part I) by R. A. Dyer, etc.

Caladium Edition, with articles on Caladium by W. Hayward, on Winter Jasmine by Prof. Norton, on Bartram's Ixia by W. Hayward, and Plant Life Library (book reviews), the American Plant Life Society, and Seeds and Plants Directory.

Vol. 7 (Nos. 1—4) 1951. 51 illustrations, a total of 174 pages.

1951 HERBERTIA Edition, devoted exclusively to the amaryllids; the **Latin American Amaryllid Exploration Edition,** dedicated to M. B. Foster; containing Mr. Foster's autobiography, and articles on Collecting Amaryllids in Latin America by M. B. Foster, new South American Amaryllis species and other amaryllid species, Amaryllis Exhibition at Cleveland, New Orleans Amaryllis Show, Review of the genus Brunsvigia (part II) by R. A. Dyer, Hybrid Amaryllis trials at Valleevue, by Thos. R. Manley, new pink hybrid Amaryllis, Narcissus culture by Mr. Mitsch, and Dr. Cooley; Hemerocallis culture by Mr. Lenington, Hemerocallis polyploids, and other amaryllid articles.

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Vol. 8 (Nos. 1—4) 1952, with 34 illustrations, a total of 183 pages.

1952 HERBERTIA Edition, devoted exclusively to the amaryllids: the **Second Alstroemeria Edition,** dedicated to Dr. Uphof, containing an autobiography of Dr. Uphof, a review of the genus Alstroemeria by Dr. Uphof, the Amaryllis Displays at Cleveland, and New Orleans, the Orlando-Winter Park Hemerocallis show, Amaryllis evaluation by Thos. R. Manley, Dr. Thornburgh, C. E. Buck, E. Douglas, and Hermon Brown; articles on Fragrant Alstroemeria hybrids by M. B. Foster, advances in Alstroemeria culture by Harry L. Stinson, Alstroemeria articles by Prof. Bullock, Prof. Ballard, Mr. Ruckman, and E. O. Orpet. The issue also contains descriptions of a new Amaryllis species, and a new Zephyranthes species, and articles on Zephyranthes by Mrs. Clint, on Lapiedra martinezii by Dr. Fernandes, Alliums by B. Harkness, amaryllid garden material by W. L. Hunt and Thad Howard, Narcissus culture by Mr Mitsch, Crinum zeylanicum by Mr. Hayward, Hemerocallis by Mr. Gilmer, and Mrs. Henry, Hymenocallis by Mr. Woelfle, Amaryllid color by Mr. Hannibal, and other important articles.

Malvaceae Edition, with articles on the Perfect Mallow Marvel by E. Sam Hemming, a new Hybrid Hibiscus, by Prof. Ballard, and propagation of Hibiscus, by Dr. Hava; and a report on plant culture activity in the Southwest Region by Dr. Corliss, the Plant Life Library (book reviews), the American Plant Life Society and Seeds and Plants Directory.

Vol. 9. (Nos. 1—4) 1953, with 32 illustrations, a total of 166 pages.

1953 HERBERTIA Edition, devoted exclusively to the amaryllids; sponsored by the **American Amaryllis Society,** which is affiliated with the **American Plant Life Society.** This is the **Second Narcissus Edition,** dedicated to E. A. Bowles, containing a portrait of Mr. Bowles, and papers on Narcissus: a review of 40 years devoted to Narcissus breeding by Guy L. Wilson, an article on miniatures, naturalizing, decoratives, and a beginners' list by C. E. Quinn, fall-flowering Narcissus by L. S. Hannibal, Narcissus breeding by E. C. Powell, and W. R. Ballard, Daffodils in Piedmont, Virginia by H. I. Tuggle, old naturalized Narcissus in the South by Mrs. Evans, Daffodils in 1952 by Grant E. Mitsch, and Daffodils in northern California by H. I. Johnson.

There are also articles on other amaryllids, including reviews of Amaryllis Shows in New Orleans and Houston, papers on the evaluation of Hybrid Amaryllis by Mr. Manley and Dr. Thornburgh, an article on Allium by R. B. Freeman, Amaryllis species by Mrs. Mary G. Henry, the Orpets, and Mr. Burlingham, Hemerocallis by S. E. Saxton, George Gilmer, and W. R. Ballard, Calostemma by Mr. Chandler, Crinum scabrum by Thad M. Howard, Lycoris by Wyndham Hayward, Hymenocallis by Len Woelfle, and on other amaryllid subjects, including the description of two new Amaryllis species.

Agavaceae Edition, with articles on Dracaena and Cordyline by Mrs. Morris Clint, The Tribes and Genera of the Agavaceae, and Polianthes tuberosa by Hamilton P. Traub, Beaucarnea recurvata by Mulford B. Foster, and sections on The Plant Life Library (book reviews), the American Plant Life Society, a complete list of publications, and Seeds and Plants Directory.

Vol. 10. (Nos. 1—4) 1954, with 23 illustrations, a total of 143 pages.

1954 HERBERTIA EDITION, devoted exclusively to the Amaryllids; sponsored by the American Amaryllis Society, which is affiliated with the American Plant Life Society. This is the **Second Amaryllis Edition,** dedicated to Thomas R. Manley, M. S., and contains an autobiography of Mr. Manley and three valuable articles by Mr. Manley on the evaluation, forcing culture and merchandising of Amaryllis; articles on the Divisions of cultivated Amaryllis by H. P. Traub, evaluation of Amaryllis by Dr. Thornburgh, the McCulloch hybrid Amaryllis by Edith B. Strout and Polly Anderson, Amaryllis and other amaryllid culture by Armyn Spies, Mrs. W. D. Morton, Wyndham Hayward, Mrs. Jo. N. Evans, and Dr. Philip G. Corliss; Amaryllis insects and mites by Dr. Floyd F. Smith and C. L. Burlingham; Amaryllis propagation by

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The **General Edition,** contains articles on the Giant Aborescent Philodendrons and the Delightful Ginger Lilies by Wyndham Hayward, the genus Nothoscordum by H. P. Traub, a note on the new Code for naming Cultivated plants, the Plant Life Library (book reviews), the American Plant Life Society, a complete list of publications, and seeds and Plants Directory.

Vol. 11. (Nos. 1—4) 1955, with 33 illustrations, a total of 146 pages.

1955 HERBERTIA EDITION, devoted exclusively to the Amaryllids; sponsored by the American Amaryllis Society, which is affiliated with the American Plant Life Society. This **General Amaryllid Edition** is dedicated to Dr. Robert F. Hoover, the 1955 Herbert Medalist, contains the autobiography of Dr. Hoover, and an article that brings the nomenclature of the Brodiaea Lilies up to date. Articles on **Amaryllis** include—evalution of hybrid **Amaryllis,** by Dr. Thornburgh, reminiscences by W. E. Rice, more experiences with Dutch **Amaryllis** by Mr. Weisner, 27 years with **Amaryllis** in northern Illinois by Mrs. Tebban, growing **Amaryllis** in California, by Mr. Stewart; and a report on collecting **Amaryllis** in South America in 1954, by Prof. Ira S. Nelson.

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[PLANT LIFE LIBRARY, continued from page 114.]

FIELD CROP PRODUCTION, by H. K. Wilson and W. M. Myers. J. B. Lippincott Co., 227 So. 6th St., Philadelphia, Penna. 1954. pp. 674. Illus.

In this new book, which is designed primarily for use as a text, the objective of the author has been to organize ''in readily accessible form the latest known facts in principles and practices of field crop production.'' No attempt has been made ''to prepare an exhaustive reference work. Instead an effort has been made to present the basic principles and practices of field crop production with only a minimum of detailed documentation.'' The first six chapters are concerned with the history of agronomy; plants, and plant growth; climate and soils in relation to plant growth; crop sequence and maintenance of soil fertility; and tillage. The remaining chapters are concerned with the various field crops; weeds; crop improvement by plant breeding; and producing quality seeds. This concise, easily readable text is highly recommended.

PLANT LIFE, VOL. 12, NO. 1, JANUARY, 1956

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EDITED BY
HAMILTON P. TRAUB
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PLANT LIFE, VOL. 12, NO. 1, JANUARY, 1956

HERBERTIA

1956

Year Book of
The American Amaryllis Society
22nd issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California

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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 153.]

PREFACE

The 22nd issue of HERBERTIA, the yearbook of the AMERICAN AMARYLLIS SOCIETY, is dedicated to Mr. Edwin Owen Orpet, who received the 1956 HERBERT MEDAL AWARD for his outstanding service toward the advancement of the amaryllids, particularly for introducing the pure white *Brunsvigia* x *multiflora* hybrids, commonly called Hybrid Cape Belladonna lilies, from Australia. These are hybrids between the Cape Belladonna, *Brunsvigia rosea* and other *Brunsvigia* species. Mr. Orpet has also been foremost in popularizing these fine plants in America. Mr. Orpet's work with other amaryllids has also served as an inspiration to those interested in this group of plants. A charming biography of Mr. Orpet with portrait is contributed by Mrs. Mildred Orpet.

Articles on amaryllis in the present issue include pure white and double amaryllis, and rooting problems by Wyndham Hayward, Report of Amaryllis Committee Chairman, by Dr. Thornburgh, Amaryllis in Dallas by Mrs. Seale, Amaryllis breeding and culture by J. F. Stewart and Chas. Snyder, greenhouse culture by Mrs. Morton, and an Andean *Amaryllis* species by Mrs. Strout, Mrs. Kane and Mr. Hannibal.

There are articles on exploring for amaryllids in Mexico, and for *Amaryllis* in South America by Prof. Nelson and Miss Henry; *Zephyranthes flammea* by Mrs. Clint, *Haemanthus zambesiacus* by Hannibal, *Narcissus* breeding by Dr. Cooley, *Eurycles sylvestris* and *Pancratium zeylanicum* by Mr. Hayward, Amaryllids by Mr. Harradine, Survey of Pancratieae by Mr. Woelfle, *Pseudostenomesson vargasii* by Mrs. Strout, New Daylilies and daylily performance by Dr. Corliss, breeding daylilies by Prof. Saxton and Mr. Gilmer, *Bloomeria humilis* notes by Dr. Hoover, Amaryllis Round Robin notes by Mrs. Strout.

There are articles on *Rhodophiala, Hymenocallis* species, *Lycoris straminea,* the New Orleans and Greater Gulf Coast (Mobile) amaryllis shows, and various other items.

The Amaryllis fraternity has suffered serious losses in the passing of Hermon Brown, La Forest Morton, David J. W. Chandler and Albert Pam. In memoriam notices for these are included in the present edition.

The 1957 HERBERTIA, the 23rd issue of the yearbook of the AMERICAN AMARYLLIS SOCIETY, will be dedicated to Mrs. Morris Clint of Brownsville, Texas, for her outstanding contributions in collecting various amaryllids, particularly *Zephyranthes* and *Hymenocallis* species in the United States and Mexico.

Contributors to the 1957 issue are requested to send in their articles by August 1, 1956 in order to insure publication of this edition in early January, 1957. Time of publication depends entirely on the receipt of the articles and the cooperation of all towards early publication will be greatly appreciated.

December 15, 1955,
5804 Camino de la Costa,
La Jolla, California

Hamilton P. Traub
Harold N. Moldenke

CORRIGENDA

PLANT LIFE, VOL. 11, 1955

Page 63, 1st paragraph, last line, change "*Brodieae*" to "*Brodiaea*".
Page 124,
  1st paragraph, last line, change "*serphyllum*" to "*serpyllum*".
  2nd paragraph, 5th line, change "*serphyllum*" to "*serpyllum*".
  4th paragraph, 1st line, change "*serphyllum*" to "*serpyllum*".
Page 125, 2nd paragraph, 3rd line, change "Sect. *Uniflora*" to "Sect. *Uniflorum*".
  6th line from bottom, change "2b" to "1b".
  8th line from bottom, change "2a" to "1a".
Page 128, under species 12, change "*patagonica*" to "*patagonicum*".

[PLANT LIFE LIBRARY, continued from page 162.]

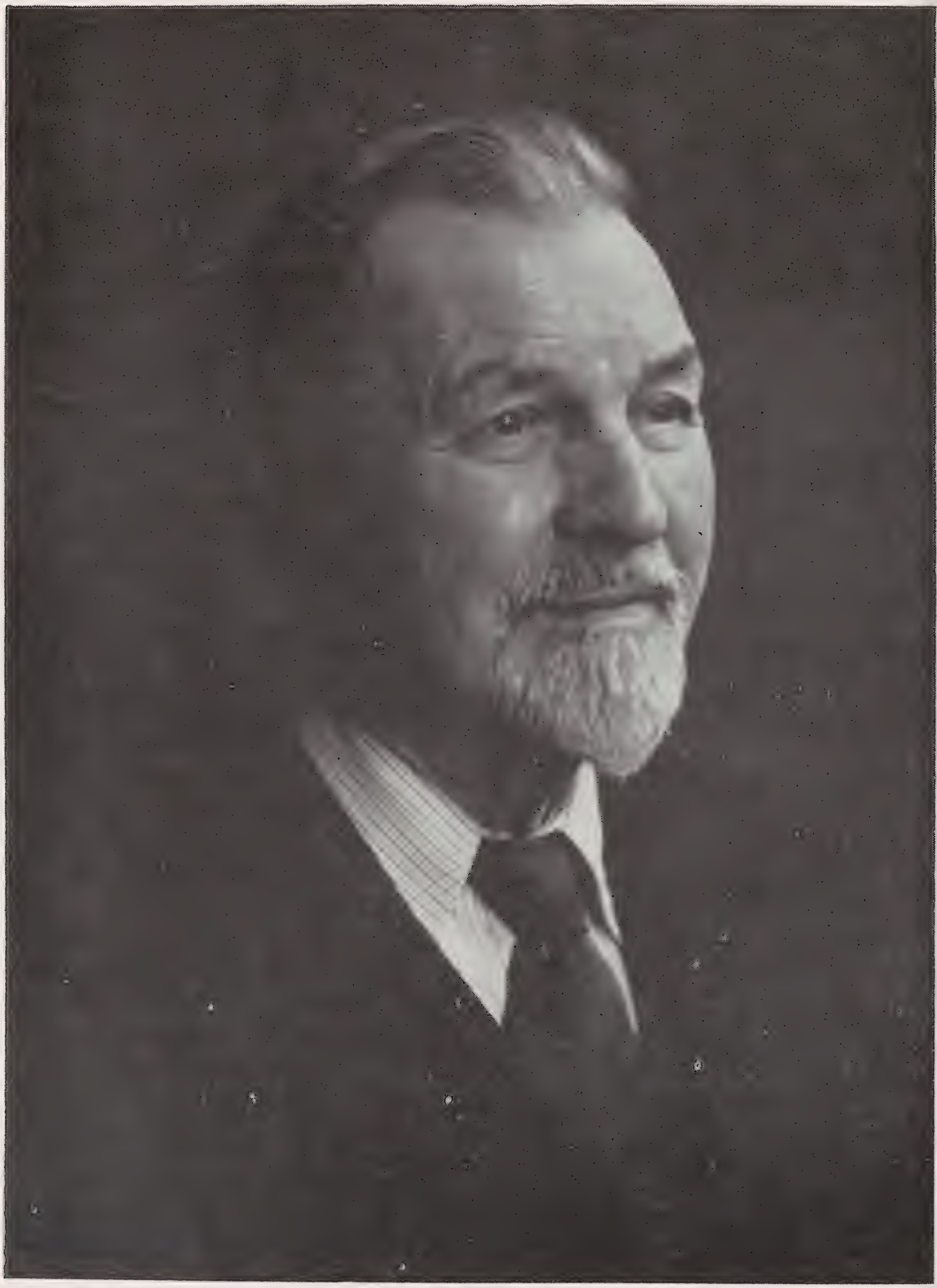
SOIL WARMING BY ELECTRICITY, by R. H. Coombes. Philosophical Library, 15 E. 40th St., New York 16, N. Y. 1955. pp. 116. Illus. $4.75. In Part I of this little book, chapters are devoted to the history of the subject; early experiments; installation of soil warming equipment for greenhouses, cold-frame and cloche; costs, and the relation of soil fertility to soil warming. Part II is devoted to soil warming in relation to the crops—vegetables, fruits and flowers; to inter-cropping, and the extension of soil warming to crops as yet untried. Highly recommended to all who are interested in this subject.

MICROBIOLOGY, by E. A. Gray. Philosophical Library, 15 E. 40th St., New York 16, N. Y. 1955. pp. 175. Illus. $3.75. This little book is designed as an introduction to microbiology. The author shows how organisms are intimately associated in nature, and by stressing the historical background, he shows that microbiology has been studied under another name for three centuries. This concise, easily readable text is highly recommended.

[PLANT LIFE LIBRARY, continued on page 84.]

Dedicated to

Edwin Owen Orpet



Herbert Medalist — Edwin Owen Orpet

Plate 1

EDWIN OWEN ORPET — A BIOGRAPHY

Mildred Orpet, *California*

On the eleventh of February, 1863, in the old Roman outpost of Cirencester in the Cotswolds, Edwin Owen Orpet was born, the first child of Owen and Mary Emery Orpet. Cirencester is not only a famous old historic city, but the site of the first agricultural college in England and a center of interest in plant improvement. Owen Orpet was a gardener of no mean attainment, employed by Mr. Elwes whose name became famous for his work in hybridizing Nerines. From its inception he subscribed to the English Gardener's Chronicle—a journal read by his son even today. Young Orpet's formal schooling came to an end with his eleventh year, when he served as office boy to a local lawyer,—from there he went to a job in the Royal Agricultural College and at fourteen he was sent to be a garden apprentice at Lockerly Hall in Hampshire, a hundred miles from home. Here he was trained in all branches of greenhouse and conservatory plant culture for five years, and on his own initiative he made an extensive collection of ferns, adding through his life to his herbarium until in California it fell into the hands of visiting grandchildren and forthwith perished. At the time of his apprenticeship also he acquired a copy of The Gardener's Assistant (a book three inches thick of fine print) which was a scientific and practical handbook and one he studied with care, and later supplemented with Nicholson's Illustrated Dictionary of Gardening from which he memorized the botanical names of plants with their meanings; this study laid the foundation for his remarkable store of knowledge of plant names, characteristics and habitats,—a store to which he is still adding with undiminished zest. A few years ago when the new 4-volume edition of Nicholson's Dictionary of Gardening appeared, he read carefully through all four volumes with the most intense and concentrated interest.

During this first period of apprenticeship he was much intrigued with a plant of *Bomarea carderi* climbing in one of the glass houses. This plant is figured in Nicholson, and has never been re-introduced although Mr. Orpet has been at great pains to try to procure it ever since he has lived in California. *B. caldasiana* grows here easily under lath, flowers and seeds well, but it is the only one he has grown freely.

After five years at Lockerly Hall, he went to Trentham, the seat of the Duke of Sutherland in Straffordshire, for further training and when he had mastered the course offered there he went to a nursery in Chester where he was put in charge of the greenhouses. He was just turned twenty at the time, and to conceal his youth he cultivated side whiskers, graduated to a foreman's job in New Ferry, and then got the post of foreman in the Marquis of Headfort's gardens in Ireland where he was able to make an intensive study of outdoor planting including that of a

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famous old herbaceous border. This garden was in the charge of a man who probably knew as much as any man living about herbaceous material. While this was not his first experience with Amaryllids, to experience the sight of thousands of naturalized *Narcissus* must have given him an impetus toward the study of that family of plants. Indeed, his first article published in Garden and Forest in 1889 was on the subject of *Narcissus cyclamineus* and I well remember the joy with which he showed me the first bloom I had ever seen of *N. bulbocodium* which he had planted in our garden some months previously. Alas that type of *Narcissus* is not persistent in this section,—three seasons at most and out it goes.

In 1887 when he was twenty-four he came to the United States and was in charge of the Woolson Nursery in Passaic, New Jersey. They were growing and introducing, also exporting to England, native American plants, notably California lilies at that time being collected by the late Carl Purdy. In 1888 he compiled a hundred-page list of hardy perennial plants which served as a descriptive catalog for the nursery. It is interesting to note that he listed three varieties of Alstroemerias,—*A. aurantiaca, A. chilensis* and *A. peruviana* which from its description sounds like the one we know as *A. psittacina.* He also listed eight Day lilies, all of them species. During the three years of his work in New Jersey he lived in the same house with Dr. Thurber, one of our old botanists and plant writers of eminence, who was at great pains to instruct and tutor young Orpet and who taught him much which he would never otherwise have learned. He says that ''Old Doc Thurber tried to make a botanist out of me, but he never succeeded.'' It was at this time that he originated a method of grafting *Clematis paniculata* onto our native clematis ''as thick as a broom straw'' and arranged for its first distribution in New England gardens.

After leaving New Jersey Mr. Orpet went to South Lancaster, Massachusetts, to be in charge of the 300 acre estate of Mr. E. V. R. Thayer. He stayed there for twenty years, until after Mr. Thayer died. It was a full life there,—he married and two sons were born there; he hybridized, raised and showed the first collection of hybrid *Cattleya* flowers ever originated in this country, working entirely from species collected in the wilds and bought at auctions, with no information to guide the grower in the way of native locale, because collectors were so jealous of their hunting grounds that they lied about where they were. Beginning with nothing but a few plants, in the course of those twenty years he had six greenhouses full of orchids, as well as extensive vegetable and flower gardens and magnificent grounds. His work with orchids is well known even to this generation through the articles he contributed on their culture to Bailey's Encyclopedia of Horticulture,—the outstanding thing about it is that he pioneered alone all along the way, devising means of crossing, germinating and raising to the successful flowering of his orchids. He experimented also with other types of plants, including *Amaryllis* L. (syn.-*Hippeastrum* Herb.). By sending seedling orchids for exchange with English growers, he obtained about 200 seeds of the famous Holford collection in Westonbirt, raised them in pots for winter flowering and also shipped them in bud for use as cut flowers. He also did some experimental work with Nerines, and got his stock from Professor Sargent of the Arnold Arboretum. Incidentally he brought his Nerines to California and later gave them to Richard Diener for his experimental garden in Oxnard.

From Massachusetts Mr. Orpet went to take charge of Walden, Mr. Cyrus McCormick's great estate in Illinois. Mr. McCormick's great interest was in trees, and in developing ''all outdoors'' so for this purpose Mr. Orpet made a wide but intensive study of available native flora in that section, going as far as Michigan and Wisconsin woods for material which he shipped back and planted by the carload. He was famous for his herbaceous borders. At this task he spent nearly eight years, going from there to California to be senior propagator for the plant introduction section of the U. S. Dept. of Agriculture at Chico. He was fascinated by the problems presented in raising seeds sent in by explorers like Meyer in China, and in learning all he could about Pacific Coast plants and growing conditions. He worked with Dr. David Griffiths in his experiments with narcissus, iris, lilies and opuntias; at the same time he studied the big planting of persimmons (over fifty kinds) and grapes at that station. When the war was over he came to Santa Barbara, bought acreage, planted persimmons and grafted the wild Chinese stock with the best varieties he could find, and although he had planned to retire, he found a position greatly to his liking in the park system and was made superintendent. This position gave him further opportunity for experiments with exotic materials suitable to local growing conditions, and he increased the beauty of park and tree planting notably during the ten years of his incumbency. That, however, was not enough to sate his appetite for new plants and he experimented at home with cacti and succulents introducing many new Aloes and Aeoniums all of which he grew from seed collected in the wilds where they grew, flowering *Eucalyptus mallees,* Bromeliads, rare shrubs, vines and finally bulbs. He left the park work in 1930 owing to his wife's illness, but lost her, after forty-two years, in 1931.

Most of the bulbs belonged to the *Amaryllidaceae,* although he also did a good deal of work with Iris. He had been greatly taken with the first white Hybrid Brunsvigia he had ever seen in the collection of the late Mrs. Bullard (of Watsonia fame). The hybrid Brunsvigias are the result of crosses between the Cape Belladonna, *Brunsvigia rosea* (Lam). Hann. (syn.-*Amaryllis belladonna* Herb., auct. non Linn.), and other *Brunsvigia* species. After Mrs. Bullard's death he acquired a bulb, and casting about for more he discovered a source in Australia. In December of 1935 he ordered *Brunsvigia* x *multiflora* bulbs as follows. *B.* x *multiflora alba; Intermedia; Baptisti;* 'Hathor'; 'Harbord' and *B.* x *multiflora rosea.* Eighteen months passed before we saw a bloom because two rest periods came together owing to the transfer from a land ''down under.'' Of these only three varieties persisted;—*Brunsvigia* x *multiflora alba,* 'Hathor', and *B.* x *multiflora rosea,* all making offsets and seeds freely. We hand pollinated the white varieties, and carefully saved the seeds, and were interested to find that after some days many of the seeds showed traces of pink, so these we discarded. We planted only those which remained white. Mr. Orpet wrote an account of this change in seed color in HERBERTIA of 1943, pp. 124-126. Subsequently we found that most of them came true although once in awhile even with the greatest care in selection there would be a blooming head colored the faintest dawn pink, and it has happened that a head perfectly white in full flower would show pink on fading. *B.* x *multiflora rosea* has been enormously prolific and shows great variations in tone from very deep pink to a white-throated type edged with pale pink, all having tall stems and very numerous flowers.

Amaryllis immaculata which was imported by W. M. James from the Argentine has been a great success both as a garden subject and greenhouse plant. It flowers with its foliage which is very handsome, has done very well both in full sun and in part shade. There has been some discussion in Herbertia as to the length of time it takes to recover from being moved but although our bulbs were moved in January of this year three bloomed well, so we hope to have a good flowering next summer. *B.* x *multiflora alba* has not been a success in greenhouse conditions so far as we can learn, but it is a gem out of doors, and established old clumps flower magnificently.

At this same time Mr. Orpet was experimenting with various *Lycoris,* finding that *L. squamigera* is not too happy here though it does better under lath than in full sun; *L. aurea* does well under both conditions; *L. radiata* grows almost anywhere and will take more water than most of these bulbs; one *Lycoris* species flowered sparsely and was not a really clean white so it was banished. *Lycoris incarnata* with a beautiful flesh tint increased copiously and grew untended for years in the open field.

An experience we had with Calostemmas: an amateur in Orroroo, S. Australia, Mrs. James T. Gray, sent seeds of *C. purpureum* in the fall of 1936. It flowered first in 1942, a small bulb which produces a long stem and a crowded head of small flowers. It is interesting as being one of the few Amaryllids native to that section, and has been found on islands off the southwest coast of Asia. In 1954 I found to my surprise three solid rows of those little bulbs, with four distinct colors,—dark rose, light pink, white, and gold, all flowering lustily and making seeds so freely they must have known a bulldozer was in the offing to clear the ground for another nursery in the making! It is more than likely that some other rare bulb collector had given them to us but there were no labels other than color and genus. Grown and flowering all together like that they were most charming and seem to be much more durable than other small bulbs, as for instance the Lachenalias. We lifted them and gave them to an Amaryllid collector and hope to hear later that they have been given homes in other gardens.

Leucoryne ixioides odorata caused a great furor when it was first introduced, and Mr. Orpet had what was probably the first big planting of it, flowering it in March, 1931, as he was growing for John Scheepers, Inc. the bulbs which Clarence Elliott brought in from South America. The seeds which Mr. Elliott brought back from the same trip, at least a large quantity of them, were sold to Mr. W. R. Dickinson and grown with great success by W. M. James whom I do not have to introduce to readers of HERBERTIA. Mr. James and Mr. Orpet worked closely together for years, sharing both experiences and materials with enthusiasm. A planting of *Leucocoryne* in flower is a great sight, but like so many things introduced with great hope, it has not been a success as a general garden subject,—we have sold bulbs repeatedly only to have it reported that they died out after a few years, and in some cases never did so well. We find even yet an occasional flower come up from long-dormant seed, but as a rule we see it only once or twice. Mr. Orpet wrote a letter to Mr. Elliott in September 1944 which I quote: ''I remember your visit here, the seeds of *Leucocoryne* you left here have been grown with great success . . . it is a difficult and costly bulb to raise *from seed,* the first year the tiny bulbs delve down at least sixteen inches, these have to be sifted out with water running all the time to discover them, but after replanting a normal depth is maintained and digging is easier. Of course the *Leucocoryne* is possible outdoors only here, glass culture is required elsewhere. But the flower is delightful in color and fragrant. The bulbs you sold to Scheepers were sent here to be grown as perhaps you will remember. These were kept three years for seed purposes and were sold I believe finally on the strength of the reputation the plant had merited. I found, however, that intense seeding (at times three spikes to a bulb in seed) finally killed a large proportion of the stock, and I had trouble in convincing Scheepers that this was a logical shortage.''

While Mr. Elliott was here selling his seed of *Leucocoryne* he told Mr. Orpet the story of his discovery of *Alstroemeria violacea* in Chile. As he could not stay for the seeds to ripen, he got down and scratched in the gravel among the plants for ripe seeds from the previous year, and found about 100 which he took back to England. He germinated only one but raised and showed the plant and received an award, but later the plant was lost. In the meantime Dr. Harper Goodspeed on the expedition of 1938-39 which he described in HERBERTIA of 1940, found and brought back to Berkeley seeds of *A. violacea.* Mr. Orpet procured 300 seeds, along with instructions for planting all of which indicated that no matter what the treatment of seeds ''vernalization,'' cold or hot treatments, chipping, sulfuric acid, soaking in water etc.'' there must be a full year from planting to germination, and flowering might take place five months after that. Mr. Orpet put his seeds in a pan of water, was called away for nearly two weeks and remembered in panic that his seeds were still soaking on his return. He found each seed showing a little white germinal point sowed them at once (in April) and was rewarded not only with a quick germination but 350 little plants (owing to a double embryo in some) a few of which flowered in June of the same year. *A. violacea* has proven to be a difficult subject though very well worth growing. Both Mr. Elliott and the Univ. of California Botanic

Garden lost their plants, and fortunately Mr. Orpet was able to supply them. He found that the tubers do not transplant easily so after a few failures he supplied only seeds to customers. Seeds, too, are not a reliable crop because in seasons of heavy fog they simply will not set and we have just had two crop failures in succession, although our records show that in one season we collected 8 oz. of seed from this self-same stand. That it is difficult is borne out by the fact that it is described in Baker's Handbook of the Amaryllideae (1888) and it goes without saying that anything so beautiful would not have been allowed to die out if any way had been found to prevent it. Probably the story is the same as that with *Leucocoryne,*—they both are native to high desert regions, and resent foggy or damp weather in their flowering seasons.

Although the color of *A. violacea* is very beautiful (it matches the HRS color True violet 36-2 perfectly) Mr. Orpet thought he might be able to get a lighter blue if it were mixed with *A. pelegrina alba.* Our plants of these two species grew side by side with no other plant of the genus near, and during the summer of 1943 both plants were crossed and recrossed. The results were not at all what was expected, for only occasionally is there a flower with violet coloring, on the contrary the flowers look like *A. pelegrina* except that they are a little larger, and the foliage is exactly that of *A. violacea.* Mr. Lytel who followed Mr. James at Mr. Dickinson's garden made the same crosses with the same results. The hybrid grows well and seeds freely,—we have never dug any tubers and the planting is still in its original bed.

About 1937 a customer of ours saw what she called *''Alstroemeria ligtu'' angustifolia* at the RHS Chelsea Show, and was so enthusiastic about it that he sent to Constable for tubers of it and later for tubers of *A. haemantha.* The *A. ligtu* had flowered and seeded in 1938 and proved to be a fine tone of pink. The *A. haemantha* flowers were fine in color and a little different in shape from the usual *chilensis* strain but though we kept two separate patches growing by themselves we lost both. We still have some of the original pink Constable tubers and seed therefrom. As far back as 1940 Mr. Orpet, Mr. James and Mr. Harry Stinson were discussing the differences between *A. ligtu* and *A. chilensis* and finding them about like tweedledum and tweedledee, so this nursery adhered to the import name, but now I find they are merged into *A. chilensis* so from now we shall use that name! Mr. Stinson sent Mr. Orpet seeds and small tubers of various others; *A. hookeri* is a charming plant, low-growing with feathery foliage, persistent in the right location which is hot and dry, but not any more than holding its own; *A. pulchra tricolor* is my favorite,—growing not over a foot high with pansy-faced flowers and the color maroon and white. Unfortunately they were planted under a small tree which eventually gave them too much shade and they perished, but I had some 5-year old seed which germinated well and gave promise of a good crop but they were in the direct line of demolition of a grading process for the new nursery. *A. chilensis, A. pelegrina* and *A. pelegrina alba* were all sown in the open field,—*A. chilensis* throve amazingly with no care beyond occasional watering when the winter rains stopped too early. The other two types failed out in the sun but did well under lath. *A. chilensis* grows larger and with better color under lath, but the sight of a field of color in late May here is breathtaking. One-year tubers transplant well, but after that, as Mr. Orpet says, "you don't dig them, you mine them." One imperative with Alstroemerias is complete rest after the flowering is finished. If they get too much water all sorts of trouble ensues. There seems to be a tendency after some years for orange types to predominate,—in which case the remedy seems to be to pull out the orange flowers and not let them go to seed, leaving the preferred colors to re-seed the beds.

The Nerines have been fascinating, but many of the finest are so over-bred that they do not reproduce easily. This seems to be true of many of the expensive Barr hybrids, and it has been so with the Elwes hybrids which Mr. Orpet received from Col. Stephenson Clarke in exchange for *Alstroemeria violacea.* From Col. Clarke Mr. Orpet received six dozen bulbs of about ten different varieties, all named and labeled late in the summer of 1945. Although we have treasured them, they have gone out one by one until now we have only twenty, ten of which bloomed this year, and these mostly a beautiful pale salmon color. Twice we imported lots from Mr. Vandertang who raises them on the Island of Jersey. He was able to save them in the German occupation only because the Germans expected to become owners of the islands and wanted to have those flowers! We have not any of these left. But the kinds which do succeed grow like weeds,—*N. bowdeni, N. magnifica* which looks very much like it but is much larger, *N.* 'Pink Triumphant' which blooms in mid-winter. Smaller types like *N. rosea crispa* are better and paler in color, and hold their own,—*N. filifolia* and *N. massonarum* are both evergreen with the same threadlike foliage, and are charming miniatures, spreading well by seed.

Haemanthus coccineus is a weed here, interesting largely for the foliage but growing with no care at all; *H. katherinae* is outstandingly beautiful both as a garden plant and cut flower, loves the shade, and in a large planting some bulbs will give bloom in June and some in September. *H. albiflos* persists but has not been too happy with us; *H. multiflorus* we imported but it was too tropical for our conditions so we shipped it to Florida. Stenomessons were a fine sight but bloomed only once or twice. *Chlidanthus fragrans,* a lovely small clear yellow fragrant flower blooms in May but does well only when the bulbs are lifted and stored for the winter,—it persists in the open ground but sulks. *Sternbergia lutea* on the other hand seems to thrive anywhere, in sun or shade, and blooms lustily in the fall when there are few blossoms to be seen. *Vallota purpurea* we have tried time and again with very little to show for our pains. Cypellas,—beautiful but brief; *Cyrtanthus* persists but is of inconsiderable value; all the *Zephyranthes* are happy with no special care; *Hymenocallis narcissifora* is temperamental about blooming while *festalis* is not only dependable but much more beautiful. The little old *Pancratium maritimum* has been in old gardens here for generations as has *Sprekelia formosissima* and they both share the same love of periodic neglect, only to bloom forth profusely when they are watered after a long rest.

It may seem that this paper is hardly to be classed as a biography because Mr. Orpet's association with plants has been largely stressed almost to the exclusion of human relationships but as I have shared his life and work since the summer of 1932, I have found his heart is so largely with his plants and his friends chosen so exclusively in relation to their similar interests that I find it impossible to picture him except with a pen dipped in chlorophyll.

Be it remembered that most of the work Mr. Orpet has done with Amaryllids began when he was nearly 75, and that along with these experiments (a) he ran a persimmon orchard which included a large mail order business; and a nursery which specialized in rare plants, cacti and succulents and bulbs; and (b) he introduced many novelties from Australia, the Canary Islands, South Africa and South America. These experiments were of no less interest and value than his work with Amaryllids, but for readers of HERBERTIA the latter have been stressed. Now at 92 his physical share in gardening is over, but plant life is still his consuming passion and he gladly welcomes any opportunity for discussion of any phase of this subject, and no amateur problem is too elementary for him to give his full attention to solving. Speaking as he ever does from the point of view of the plant, he can always point out

Fig. 1. La Forest Morton trophy cabinet.

what its needs are, how it must be cared for to give the best results and he does this with such clarity and such sweet reasonableness that the veriest tyro can understand. He regrets only that he cannot keep abreast of modern scientific experiments with genes, chromosomes etc., and dismisses the subject with a sigh and "all that is too vast for me!"

IN MEMORIAM — LA FOREST SMITH MORTON

The news of Mrs. Morton's death on October 29, 1955 at the age of 68 years was a great shock to all who knew her.

Mrs. Morton, a native of New Orleans, née La Forest Smith, was long active in gardening circles in her native City. She was active in the Garden Circle of New Orleans which in cooperation with other local gardening societies and the American Amaryllis Society sponsored the annual New Orleans Amaryllis Show in spring. She was a member of the New Orleans Horticultural Society, and the Federated Council of Garden Clubs. She was a member of the American Amaryllis Society (affiliated with the American Plant Life Society) and was in charge of the examinations for the Amaryllis Judge's certificates, and she was Registrar of Amaryllis Names. She is survived by her husband, Mr. W. D. Morton, Jr., a daughter, Mrs. Rosalie Rodener; a son, W. D. Morton III, Glen Olden, Penna., and four grandchildren.

Mrs. Morton had just acquired a greenhouse so that she could grow her Amaryllis to greater perfection, and had sent in her first article on growing Amaryllis in the greenhouse which is published in this issue. At the request of the writer, Mrs. Morton had sent a picture of her trophy cabinet on October 26, only three days before her death. This photo is reproduced in Fig. 1. The two small cups and the smaller cup with the white base were awarded to her for being the most outstanding member of the Garden Circle for the years, 1953, 54 and 55. The other cup with a white base was presented to her when she was voted Life Honorary President. The two gold keys to the City of New Orleans were awarded for her work toward founding the New Orleans Municipal Amaryllis Garden and for outstanding work toward beautifying the City of New Orleans; and for staging outstanding annual official Amaryllis Shows since 1951. The other awards were received for outstanding exhibits at the Amaryllis Shows.

With the passing of Mrs. Morton, the horticultural world has lost a great enthusiast and an inspiring worker.—*Hamilton P. Traub*

IN MEMORIAM — DAVID J. W. CHANDLER

In the death of Mr. David J. W. Chandler of Tecoma, Australia, on the 23rd August, 1955, the world of horticulture has suffered a real loss. For many years he was Vice-President of the Royal Horticultural Society of Victoria, and in that capacity he tried to develop a wider general knowledge and love of rare and beautiful plants. His own practical contribution was to import many items not previously known in Australia and introduce them into commerce. At the same time, he himself raised some notable contributions to the world's gardens. These include such plants as early winter flowering Nerines, *Clematis* 'Golden Belladonna' (awarded a gold medal by the R. H. S. of Great Britain), Montbretias, Gladioli and many new and beautiful colours in Zantedeschias.

Mr. Chandler's ability to name rare and unusual shrubs, bulbs and plants was well known. At every horticultural show his advice was sought in the naming of items not generally known. Many a discussion on a particular variety was referred to him for an opinion and his decision was rarely questioned.

He had the highest standing as a nurseryman and for some time was Vice-President of the Nurserymen's and Seedsmen's Association.

Following a visit to Japan in 1939, he imported many new shrubs, including Camellias. These include such gems as 'Golden Temple,' named by Mr. Chandler while visiting the nursery in Japan where the Camellia was raised. Other Camellias first imported into Australia by him include *magnoliaeflora,* 'Lady Clare' and *reticulata* (Forrest's variety). Most of the shrubs introduced by him have since become widely popular in Australian Gardens.

Recognition of the collector's items acquired by Mr. Chandler came in 1948, when the R. H. S. of Victoria awarded him the first Fawkner Medal for his "Collection of Rare Shrubs and Plants."

—Reg. F. Harradine

IN MEMORIAM — MAJOR ALBERT PAM, O. B. E.

The many friends of Major Pam were shocked to learn of his sudden death on September 2, 1955.

For several years, Major Pam had visited America and especially southern California, where his interests in horticulture had gained him many friends. He always came with gifts of seeds and plants.

In our spring 1955 catalog, we tell a story about Major Pam and one of the plants that was widely distributed through his efforts. Major Pam told this story in a very humorous way and we have reproduced it as nearly as possible in his own words. The title of the story is "Ich Dien" and we will be pleased to send it to all who request it.

—Cecil Houdyshel, La Verna, Calif.

IN MEMORIAM — HERMON BROWN

An announcement should be made at this time of the passing of Hermon Brown on March 16, 1955, the date being just too late for its mention in the 1955 issue of HERBERTIA. There are many of you who

[IN MEMORIAM—HERMON BROWN, continued on page 76.]

1. REGIONAL ACTIVITY AND EXHIBITIONS

NEW ORLEANS AMARYLLIS SHOW, 1955

MRS. W. D. MORTON, JR., *President,*
Garden Circle, New Orleans

The Hon. de Lesseps D. Morrison, Mayor of New Orleans, proclaimed the period, March 28 to April 3, inclusive, Amaryllis Week in New Orleans, in recognition of the 1955 Amaryllis Show of New Orleans which was held April 2-3, 1955.

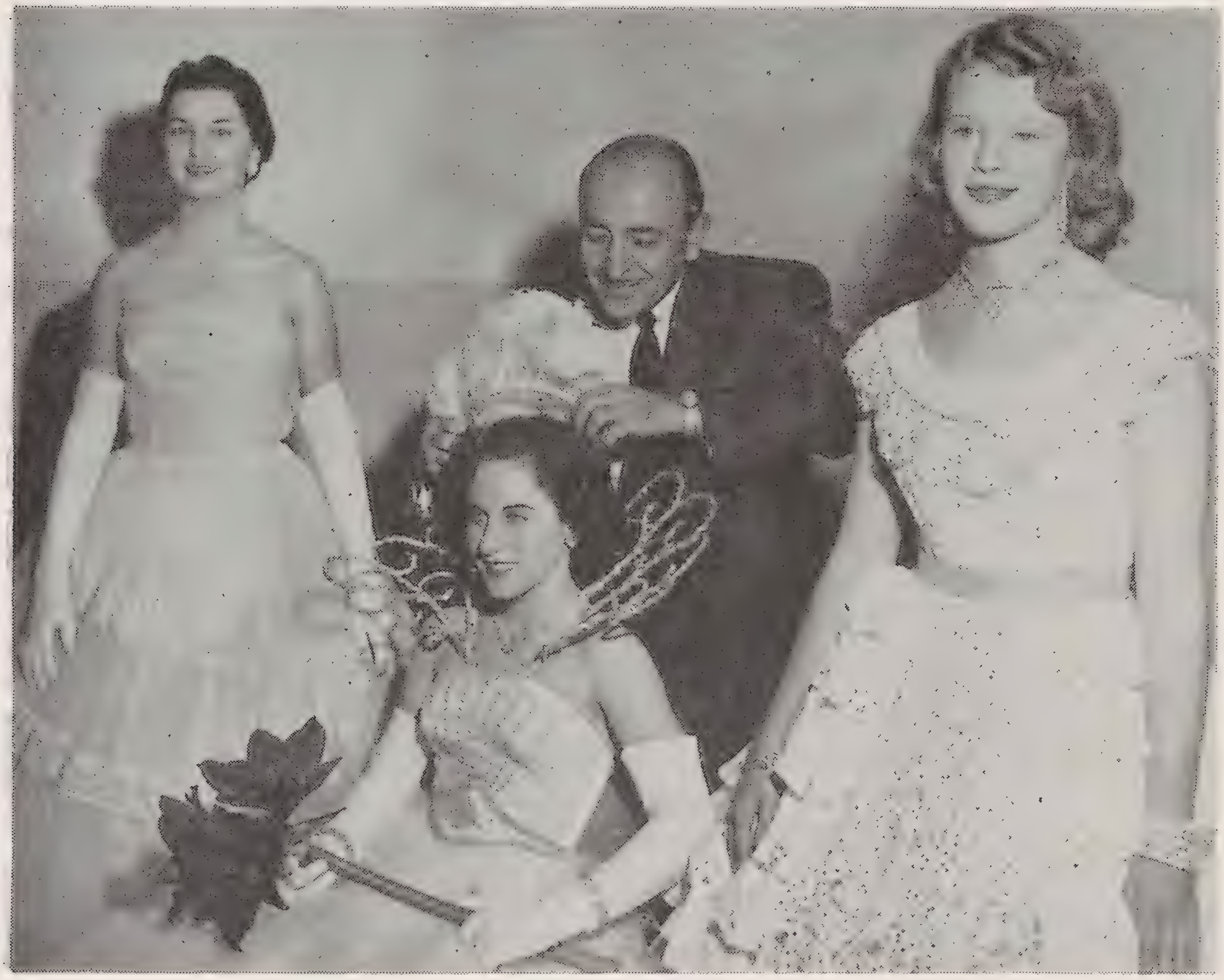

Fig. 2. The Queen of the Official Amaryllis Show of New Orleans, 1955. Miss Carol Ann Schilleci (lower center) is crowned by President of the Council—Victor H. Schiro. Maid of Honor, Miss Ennie Goodrich (left) and last year's Queen, Miss Carrol Anne Le Compte (right). Photo—*The Times-Picayune-New Orleans States.*

The Garden Circle sponsored one of the most outstanding flower shows ever staged in New Orleans, it being the eighth Official Show of New Orleans, on Saturday and Sunday April 2nd. & 3rd., 1955. The show was beautifully staged on the entire floor of the McMain Junior

High School Cafeteria, 5712 So. Claiborne Ave. The many lovely artistic arrangements, and colorful Dutch and America Amaryllis made a very striking appearance, against the Club colors of Green and Silver.

The Show was Judged by twelve accredited Judges, and all Horticulture Judges were accredited Amaryllis Judges from the American Amaryllis Society. Four Gold cups, two tri-color ribbons, two sweepstake ribbons, two Club ribbons, five American Amaryllis Society Awards in Horticulture were given. New Orleans is fast becoming the Amaryllis City of the South.

The Consul General E. L. Hechtermans of the Netherlands, gave a very interesting talk on Dutch Bulbs. The Main event of the show was the crowning of the beautiful Official Amaryllis Queen, Miss Carol Ann Schilleci, daughter of Mr. and Mrs. Rosario Schilleci, crowned by President of the Council Victor H. Schiro. Maid Miss Ennie Goodrich and Miss Carrol Anne LeCompte. Commissioner Schiro presented the new Queen with a gold key to the City. Plans have already been started for next year show.

THE GREATER GULF COAST AMARYLLIS SHOW, 1955

MRS. A. PRIMO, *Alabama*

The Greater Gulf Amaryllis Show on April 2, 3, 1955 sponsored by the Amaryllis Society of Mobile, Alabama, fulfilled all expectations even though a severely damaging freeze had visited the area several nights before the show opening.

This was a standard competitive specialty show—six divisions, 16 sections. The divisions were as follows:

1. AMERICAN NAMED AND UNNAMED HYBRIDS.

2. ARTISTIC ARRANGEMENTS. There was an invitational class in this division for the individual garden clubs which comprise the Federated Garden Clubs of Mobile County. The garden clubs responded enthusiastically with approximately twenty outstanding arrangements using amaryllis as the dominant feature. There were about eighty artistic arrangements entered in the show. One of the most unusual entries and one which won an Award of Merit, was a mass of amaryllis bloom in a mammoth plexiglas bubble. This was the work of the Florence Place Garden Club.

3. Dutch Named and Unnamed Hybrid Amaryllis. There were about 60 named varieties exhibited, ranging in color from pure white, through all the pastel tints of pink, peach, salmon, rose, to the light, medium and dark reds into maroon and purple. The unnamed Dutch hybrids, though not in the same class as to color with the named varieties, showed a very pleasing variety of bloom tint.

4. EXHIBITS OF GROWERS IN AND AROUND MOBILE. This was the spectacular beauty of mass bloom. The growers expressed their good taste, originality and their own personalities in their exhibits. Seed and supply stores also exhibited in the show with colorful tables of attrac-

tively packaged bulb plant foods, preparations and accessories for both pest and disease control, plant aids and tools, and containers both utilitarian and ornamental.

5. Arts and Novelties. Mobile artists, both master and student of the art, exhibited paintings of amaryllis in oils, water color and pastel. This was also an invitational class. These fine artists had captured on canvas the living beauty around them. There were nine entries in the hobby class. Again, originality and the expression of individual personality were the keynotes of these exhibits.

6. Competitive Educational. This division included all stages of amaryllid growth beginning with complete soil formulas and examples thereof. Seedlings were shown, from the three-month old stage of growth to the fully developed blooming size three-year old bulb. One grower exhibited specimens of bulb cuttage for vegetative propagation. This practice is becoming popular among growers in the Gulf Coast sector. These growers are developing their own highly profitable and satisfactory techniques.

A miniature working model of a ferris wheel with each basket spilling its precious burden of amaryllis bloom immediately caught the attention of the visitor to the show. This beautifully arranged focal point was placed at the end of the wide improvised corridor effected by the tables of unusual artistic arrangements to the left, and the educational, hobby and commercial displays to the right. Mr. Percy Skinner of the Amaryllis Society designed this most clever focal point for this year's Amaryllis Show in Mobile. The Men's Garden Club of Mobile brought indoors the cool loveliness of a rustic, flower-bordered pool with their special exhibit which was placed just inside the main entrance to the show. The pool was fringed with fern, caladium, amazon lilies and many varieties of amaryllis, dwarf day-lilies and narcissus. The wide corridor, highlighted at the far end by the turning ferris wheel of blossoms, stretched behind the lovely placid pool.

Mrs. E. A. Wiggins, one of our members and also a fancier of birds, added greatly to the exhibit with her beautiful assortment of tropical birds. One particularly large cage held more than fifty parakeets of various pastel colors. Bougainvillea in several beautiful colors twined in and about this cage. Smaller cages with birds in pairs were placed advantageously among the exhibits.

Hot coffee and delicious homemade cake were served and helped to create a spirit of good fellowship. Needless to say this particular exhibit helped to defray the expenses of the Show.

Mr. Harry Goff was General Chairman of the Show and to him must be given credit for much of the fine integration of exhibits. Mrs. A. Primo was co-Chairman. Mr. Ernest Thublin was Staging Chairman.

The Sweepstakes trophy, given for the most blue ribbons acquired in the show was awarded to Mrs. A. Primo. The sweepstakes trophy in horticulture was also awarded to Mrs. Primo. Mrs. Herbert J. Johnson of Mobile also received two awards, one for the outstanding horticultural specimen in the show and one for the outstanding arrangement. The trophy for the best arrangement by a garden club was won by the Cottage Hill Garden Club. Best hobby display award was won by C. A. Strain of Mobile and Bradfords Garden of Fairhope was adjudged first in commercials. A painting of amaryllis won first prize for Mrs. Dorothy Boone in that class and Mrs. E. A. Wiggans' display of birds won an award of merit. Mrs. William P. Cazalas of Mobile was presented a trophy for her series of blue ribbons won in the arrangement section.

The annual show is sponsored by the Amaryllis Society of Mobile, Alabama, Mr. Lou Costa, President.

AMARYLLIS ACTIVITIES IN DALLAS, TEXAS

MRS. B. E. SEALE, *President,*
Dallas Amaryllis Society

The Dallas Amaryllis Society was organized in April 1952 to promote interest in growing Amaryllis; to study and make research pertaining to Amaryllis breeding and culture; to disseminate information concerning Amaryllis and the supplemental study of the Amaryllidaceae family.

The Society meets on the third Tuesday afternoon of each month from October through May. The programs are given by Society members; followed by a discussion period and a "Tea Hour."

Such subjects as "Amaryllis in The Garden Design," "Amaryllis In Bloom for Christmas," "Amaryllis of Tomorrow," "Types and Strains of Amaryllis," "Growing Amaryllis from Seed," "Vegetative Propagation of Amaryllis," "Amaryllis Culture and Merchandising In Holland," "The Amaryllidaceae," "Insects and Rust on Amaryllis," "Judging and Rating Amaryllis," "Practical Arrangements of Amaryllis for the Home," "Glamorizing Table Arrangements with Amaryllis," "Why I Grow Amaryllis," "Succeeding with Amaryllis," "Louisiana's St. Joseph Lily," "Biographies of Dr. William Herbert and Mary Gibson Henry," have provided good programs.

A "Travelogue" by Margie Korn, one of the members, was given after her yearly trip to Europe. The pictures and slides taken in the bulb fields of Holland are most exotic. Amaryllis inspection and selection are high-lights of her trip.

Last year five members of the Dallas Amaryllis Society attended the Amaryllis Shows in New Orleans, Louisiana and Mobile, Alabama. The Artistic Arrangement and Horticultural Divisions of both Shows were beautifully and interestingly staged, with quality Amaryllis of named clones being an outstanding feature of the Shows.

There are six members of the Society who are nationally accredited Flower Show Judges. The members are an earnest, enthusiastic group of gardeners and they are devoting much time to the culture of Amaryllis.

The climate of North Texas permits the growing of American Strains of Amaryllis in the garden. However, we grow the Dutch Hybrids in pots in the house or green-house through the winter months.

After danger of frost is over, the pots are put into the garden soil in semi-shade to grow until fall, when they are taken up and allowed to rest for ninety days before time for another cycle of bloom and growth.

The members are growing all types of Amaryllis, except the ''Orchid Flowering'' type and we hope to grow those this year if we can obtain them. During December, January, February and March, the members exhibit their house-grown Amaryllis.

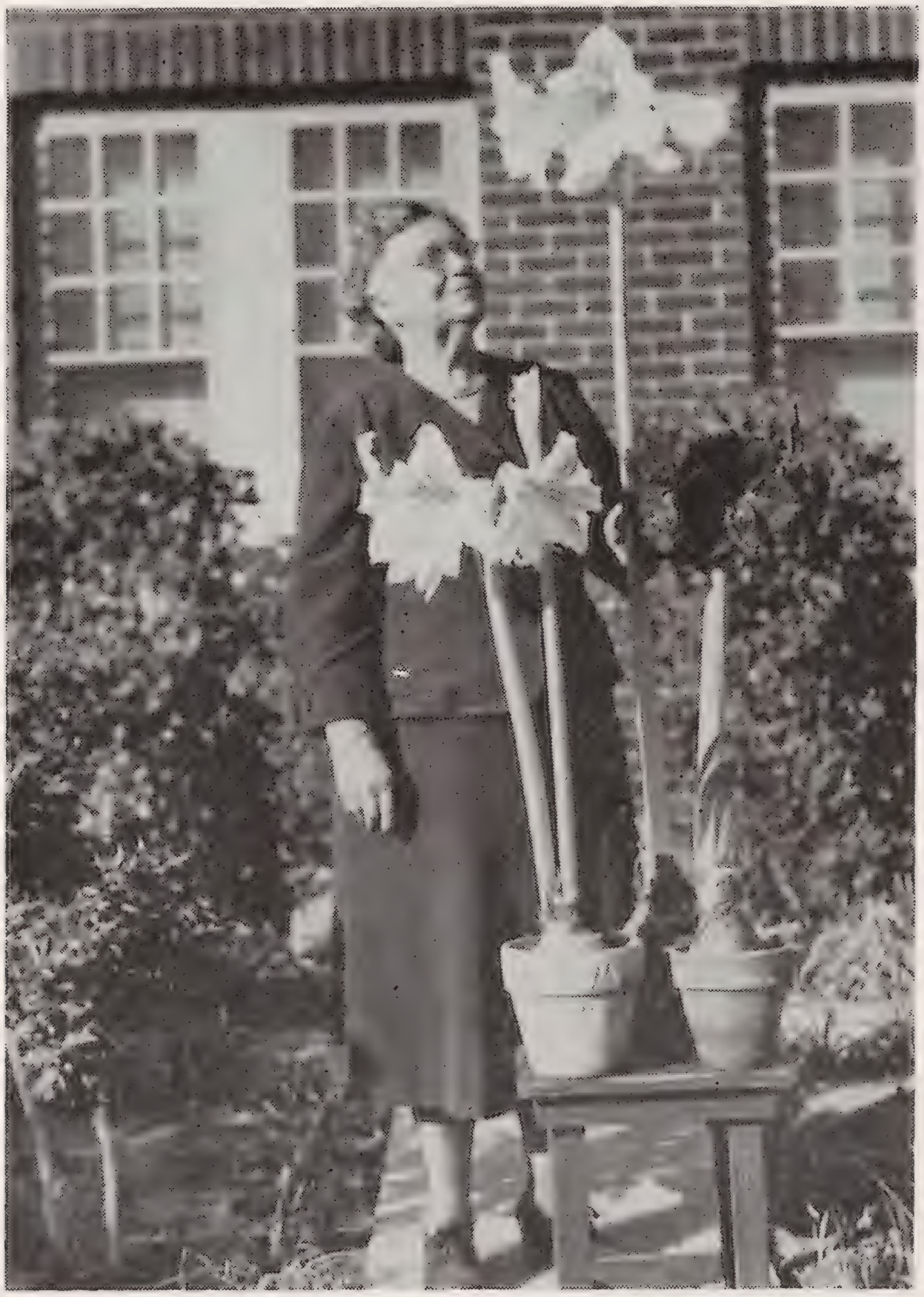

Fig. 3. Hybrid *Amaryllis* grown by Mrs. E. B. Seale, Dallas, Texas; from left to right, the two whites are 'Albino', the red, 'Queen Superiora' (van Meeuwen). Photo—Mrs. E. B. Seale.

I have several hundred Amaryllis of all colors in my garden and they are most rewarding in the springtime, making a garden of flashing beauty. I am especially proud of my seedlings. Each year I make new plantings of seeds from the Dutch Hybrids and the American Strains. I am always delighted when I have a young seedling that blooms with gorgeous beauty for the first time. It is a pleasure to share my seedlings with neighbors and friends.

The blooming hybrid *Amaryllis* shown in Fig. 3 speak for themselves as a "Tall Tale From Texas." The white Dutch Amaryllis, 'Albino,' (second from left, Fig. 3) grew two scapes; the first scape was forty-two (42) inches in height with four blooms; the second scape was fifty (50) inches in height with four blooms. A yard-stick was used to show the unusual height, also two other Dutch Hybrids of usual height for a comparison. It was grown in a sunny south window in my home last Winter.

At the Dallas Spring Show (1955), sponsored by the Dallas Council of Garden Clubs and featuring floriculture and out-door gardening, the Dallas Garden Club exhibited several hundred blooming Dutch Hybrid Amaryllis in a garden setting, grouping the various colors in an exotic garden design. This was the first time that an "Amaryllis Garden" has been entered in the annual show. It was most spectacular and won an Award of Merit and Distinction, both for growing and display.

The rugged constitution of Amaryllis enables them to grow under adverse conditions of heat and lack of rainfall, as we have sometimes in Texas in the summer. There is enough cold weather in Winter to kill the foliage and force the bulbs into dormancy, but not enough cold to freeze the American Strain bulbs in the ground.

There is a complete set of HERBERTIA (1934-1955) in the Society library; the volumes contain material for programs, study and research; they contain information of value to all gardeners because of the wide range of plant life discussed. The Dallas Amaryllis Society is the "Ambassador of Encouragement and Venture" in growing Amaryllis of all types in Texas.

FURTHER NEWS OF THE AMARYLLIS ROUND ROBINS

EDITH B. STROUT, *California*

The Amaryllis Round Robins, which started in 1943, have continued with their same high degree of enthusiasm. By comparing notes and photos with one another, many inferior bulbs have been culled out of various member collections, and better types of hybrid amaryllis are now appearing. Seedlings resulting from crosses of hybrid Dutch amaryllis imported soon after the war have been blooming, and the better ones of these kept for further parents. Pollen and seeds from the better blooms have been exchanged among members. Polly Anderson of La Canada, Calif. now has a collection of fine hybrids of her own breeding, as have other members like Richard Guerdon of St. Louis; Eunice Fischer of Oshkosh; Madge Tebben of Waukegan, Dr. Robert Thornburgh of Palos Verdes Estates, and John Weisner of Florida.

Mrs. Tebben told of her experiences with foliar feeding in the 1955 HERBERTIA, and also her plants to use fluorescent lighting in early spring and possible late fall. All of us robin members are very keen to hear about the results.

Mr. John Weisner also wrote about his seedlings and cuttage in the 1955 HERBERTIA and will no doubt write more about that for further issues. The robin members also are very interested in this and in hearing his descriptions of new blooming seedlings.

Mrs. Carrie Armstrong, a commercial florist of Joy, Ill., had to dispose of her fine collection of amaryllis due to illness and advanced age. She kept only a few of her pure white bulbs. Though she has had to stop all gardening activities, she is still keenly interested in all the doings of her friends in the robins, and enjoys hearing of their successes. She has been a member of the American Amaryllis Society since its founding.

Since all of the members grow hybrid amaryllis, there is much discussion about these bulbs. But nearly all grow other members of the Amaryllidaceae, and both Mrs. Glenn Fischer and Mrs. Fred Flick have fine collections of daylilies, originating many excellent seedlings. The most extensive and successful growers of crinums are the members who live in the southern states or in California. Mr. Fred Jones of Corpus Christi is well known to members of the Society for his fine collection of *Zephyranthes* and is also building up a collection of amaryllis species, as is also Armyn Spies of Belleville, Illinois.

In the future we hope to have a regular summary of the work being done by these and other members of this enthusiastic group of amaryllid fanciers.

EDITOR'S MAIL BAG

Our good friend, Thomas R. Manley, is now settled in his new location at Selinsgrove, Penna., and is testing a large number of Ludwig and Warmenhoven hybrid Amaryllis clones. Since his reports are based on at least two years of testing, his report on these will appear in the 1957 Herbertia.

Dr. Philip G. Corliss, the Vice-President for the Southwest, will undertake a lecture tour of England in May and June of 1956. He will talk before the Royal Horticultural Society on June 5, 1956 (slide-illustrated) on ''Plant Breeders of the United States and their Introductions.''

In the fall of 1955 Miss Josephine Henry will accompany a group of other scientists from the Philadelphia Academy of Natural Science working on river surveys on the Ucayali River east of Tingo Maria and then at Iquitos in Peru. Later she will travel as far south as Chile to make a collecting trip for various plants, including various Amaryllids. She is particularly interested in finding *Amaryllis* L., and various *Rhodophiala* Presl species. The latter are the small-flowering species formerly grouped with *Amaryllis* L.

AMARYLLIS COMMITTEE— CHAIRMAN'S REPORT, 1956

There will be one item of good news for all of us in the fact that a new book will go into publication this year by the Macmillan Company devoted entirely to the subject of amaryllis—THE COMPLETE AMARYLLIS MANUAL, by Dr. Hamilton P. Traub. It was once my privilege to examine the manuscript. Not only were the contents pleasant to read but the book is as complete as one could ask. Publication of this type of book is expensive especially with reference to the matter of illustrations. It is my understanding that the price will be at the popular level so that it will be within the reach of all who care to own it. A very good feature for those who often refer to such a book is its excellent arrangement and indexing. The following list of chapter headings will give the reader some idea of what to expect: What is an Amaryllis?, The Amaryllis Plant, The Wild Amaryllis, The cultivated Amaryllis Through the Years, Divisions of Cultivated Amaryllis, Long-trumpet and Belladonna Type Hybrid Amaryllis, Reginae and Leopoldii Type Amaryllis, Orchid-flowering, Double and Miniature Type Amaryllis, Amaryllis Breeding, Amaryllis Propagation, Amaryllis Culture: Growing to Maturity and Maintenance, Amaryllis Diseases and Their Control, Insects, Mites and Other Animal pests and their Control, Amaryllis Marketing, Amaryllis Shows, Amaryllis as a Cultural Asset, Bibliography, Appendix A. Catalog of Chromosome Numbers in Amaryllis, Appendix B. Naming or Typifying of *Amaryllis* L., and *Amaryllis belladonna* L., Appendix C. Key to the 46 *Amaryllis* species, and complete descriptions of the species, Appendix D. Amaryllis Organizations, Nurseries and Dealers, and Index.

Perhaps this will be a good time to send out an appeal to those of you who can afford a little time to write an article for the next issue of HERBERTIA. There is a great need for popular articles that would appeal to the average gardener on the subject of amaryllis of any kind. The last few issues have seen several of these come in that all have enjoyed. Let the Editor hear from you as early as possible so that space reservations can be made.—*Robert G. Thornburgh, M.D.*

[**Zephyranthes lutrae**, continued from page 29.]

description. He states that ''Kew reported that it has some resemblance to the plant known as *Cooperia pedunculata*, but differs in being almost sessile.'' On the basis of this statement, *Zephyranthes lutrae* Hort. ex Pam can be definitely placed as a synonym of *Zephyranthes drummondii* D. Don, in Sweet, Brit. Fl. Gard. ser. II. Pl. 328, March 1, 1836 (Syn.—*Cooperia pedunculata* Herb. Amaryll. 179, pl. 42, fig. 3. 1837). Recent collections of *Zephyranthes drummondii* D. Don, have conclusively shown that the pedicel length of this species varies from very short to the length as shown in the type illustration.—*Hamilton P. Traub.*

2. SPECIOLOGY

[EVOLUTION, DESCRIPTION, CLASSIFICATION AND PHYLOGENY]

PLANT HUNTING WITH THE CLINTS IN MEXICO

FRED B. JONES, *Texas*

It was my good fortune in May, 1954, and again in May, 1955, to be a guest of the Morris Clints of Brownsville, Texas, on two of their plant-hunting trips to Mexico. In the latter year an opportunity presented itself, also, to visit their trial plot which is located perhaps two or three miles from their home. So, placing myself somewhat in the position of a reporter, I should like to comment on certain aspects of these expeditions which were of particular interest to me, relate a personal experience or two, and then describe briefly the trial plot in Brownsville. All of which is intended to give some idea of the research which the Clints are carrying on and the manner in which they go about it.

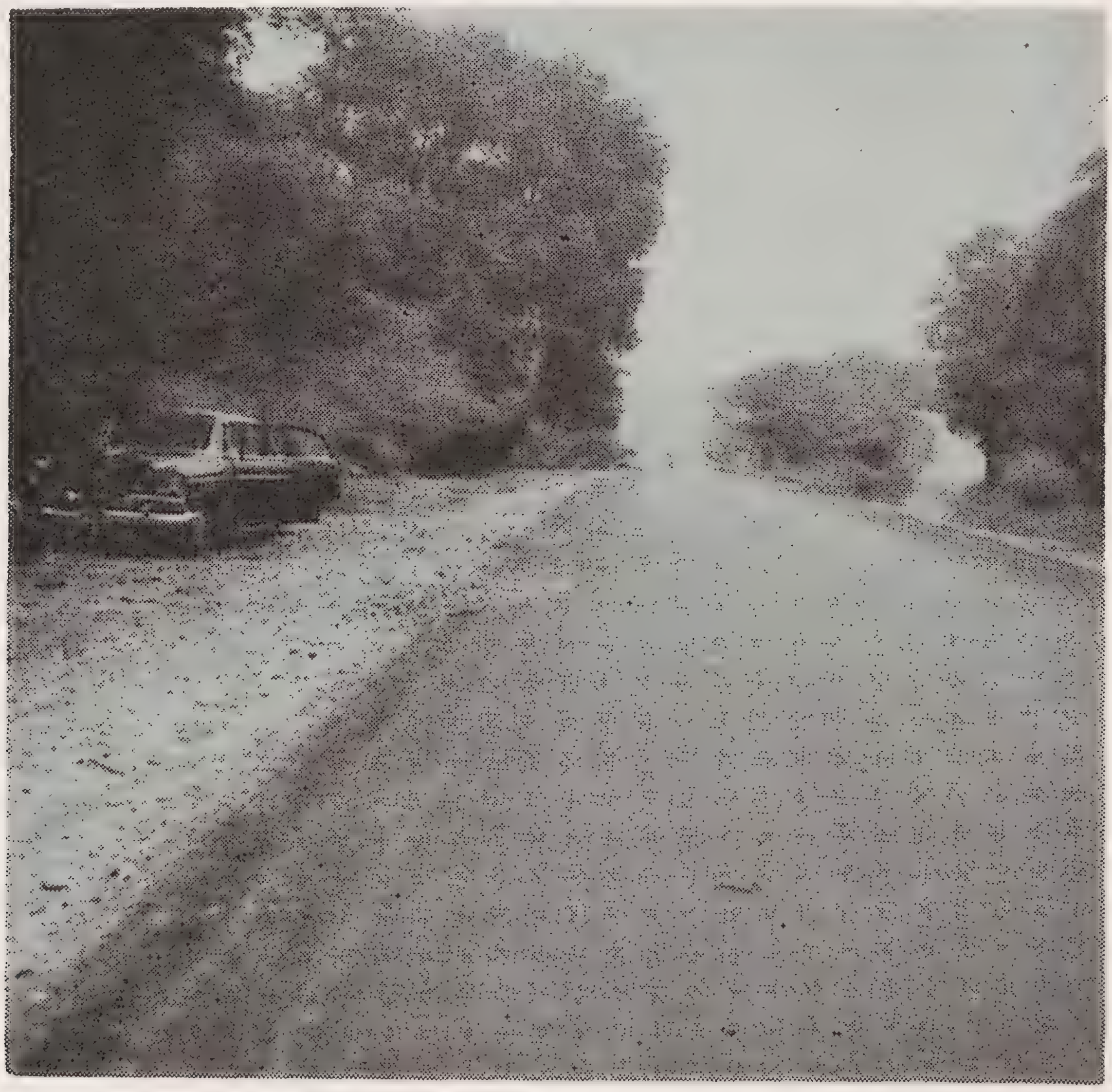

Fig. 4. Stop for lunch near the Rio Corona in Tamaulipas, Mexico. Photo—Fred B. Jones.

Kitty and Morris Clint have been going to Mexico on trips such as these for quite a number of years. Apparently they learned quickly that Mexico is one of the richest countries on earth in so far as its plant life is concerned, yet one which has not been fully explored, despite a long history of botanical exploration. Neither of them took even the beginners' course in botany while they were in college. Neither did I take such a course, nor had I been to Mexico before for the specific purpose of hunting plants. Yet, as we embarked on these expeditions, I feel certain that we all hoped to make some contribution, however slight, to the knowledge of Mexican bulbs. On these particular trips, as planned by the Clints, we were going to search for *Zephyranthes,* those diminutives of the Amaryllis family, as Wyndham Hayward has aptly described them. We would dig several bulbs of each form and variation, as Kitty and Morris had done on previous trips, and try roughly to determine the range limits of each.

Our interest in the *Zephyrantheae* dated back several years, during which time we had acquired through purchases, exchanges and field collecting, perhaps thirty of the seventy (more or less) species currently recognized, all of which are natives in warm climate regions of the Americas. Of course we had some familiarity with the literature of the subject, particularly with Baker's *Handbook of the Amaryllideae* (1888) and the well-known articles on these genera by Sealy (1935) and Hume (1937). We had learned, too, about the collections made in Mexico by Pringle in the late nineteenth century. Pringle interested us particularly because he collected in the same region which we planned to drive through. He worked along the newly constructed railroad lines, and some idea of the magnitude of his efforts may be gained from the fact that he discovered no less than 1200 species of plants previously unknown to science (see Davis, H. B., ''*Life and Work of Cyrus Guernsey Pringle,*'' 1936). In San Luis Potosi state, high on the central plateau, he found various *Zephyranthes,* among which were *Z. concolor* (yellow), *Z. verecunda* (pink) and *Z. Lindleyana* (rose). A new white species which he found was described as *Z. erubescens,* and it came probably from the same area, although no one knows for sure. Most of these bulbs and others of lesser interest were found blooming in May and June, just as the long dry season was giving way to scattered showers.

It was into this same region that the Clints chartered their 1954-1955 trips, and in each of these years, it was near the middle of May. Only we were exploring along the main highway which was constructed not so many years ago, rather than along the railroads which Pringle followed, and the two by no means run parallel to each other.

On the first trip I was anticipating with a good deal of eagerness our visit to the discovery site of Kitty's new species, *Z. clintiae* (HERBERTIA, 1952), partly because I was now personally acquainted with its co-discoverers (not a particularly scientific reason), also because, as Kitty once correctly pointed out, I am ''keen'' on type localities. The highway would lead by this spot, and I knew there was no thought of passing it up without stopping. But alas, when we had passed over several chains of mountains and had finally reached the place, Morris, who always drove, scarcely slowed down, and continued on in the direction of Ciudad del Maiz. Of course I knew something was wrong. Then it dawned on me that the Canyon de Borregos, where the species grows, was occupied by a number of the local countryfolk, and hence it would not be an auspicious time for us to stop. Actually, the Canyon was extremely dry that year, as was all the surrounding region, so that we would have found little in bloom. But on our second trip in 1955, we found the Canyon quiet with not a soul in sight. We took possession of the place this time and found some bulbs in bloom, but unfortunately, not Kitty's namesake. Beside a fine *Dasylirion* which grew in the Canyon de Borregos, I snapped a picture of the Clints (Fig. 5).

I soon found that Kitty and Morris had acquired a vast practical knowledge of Mexican plant hunting. They knew just when to stop at a location and when not to, where to look for bulbs either in flower or in leaf, and for how long—even the time factor is important. I learned that it is inadvisable to stop just anywhere: the situation must first be surveyed. At this particular season, the rural people, who are the ones the plant-collector meets everywhere, are mostly idle because the land is still too dry to work. So it is evidently quite an event for an American car to pull off to the side of the highway, and its occupants, in a businesslike manner, begin a minute search of the nearby terrain. Of course one tries to pick a spot where there will be some semblance of privacy, but likely as not, there will be people not far off. We joked about how there seemed to be a Mexican behind every bush. Our collecting was done almost entirely by the roadsides, never very far from the car which was usually in plain view. This manner of collecting would have been impracticable except for the fact that the Mexican countryside is still largely unfenced and is obviously trespassed by any-

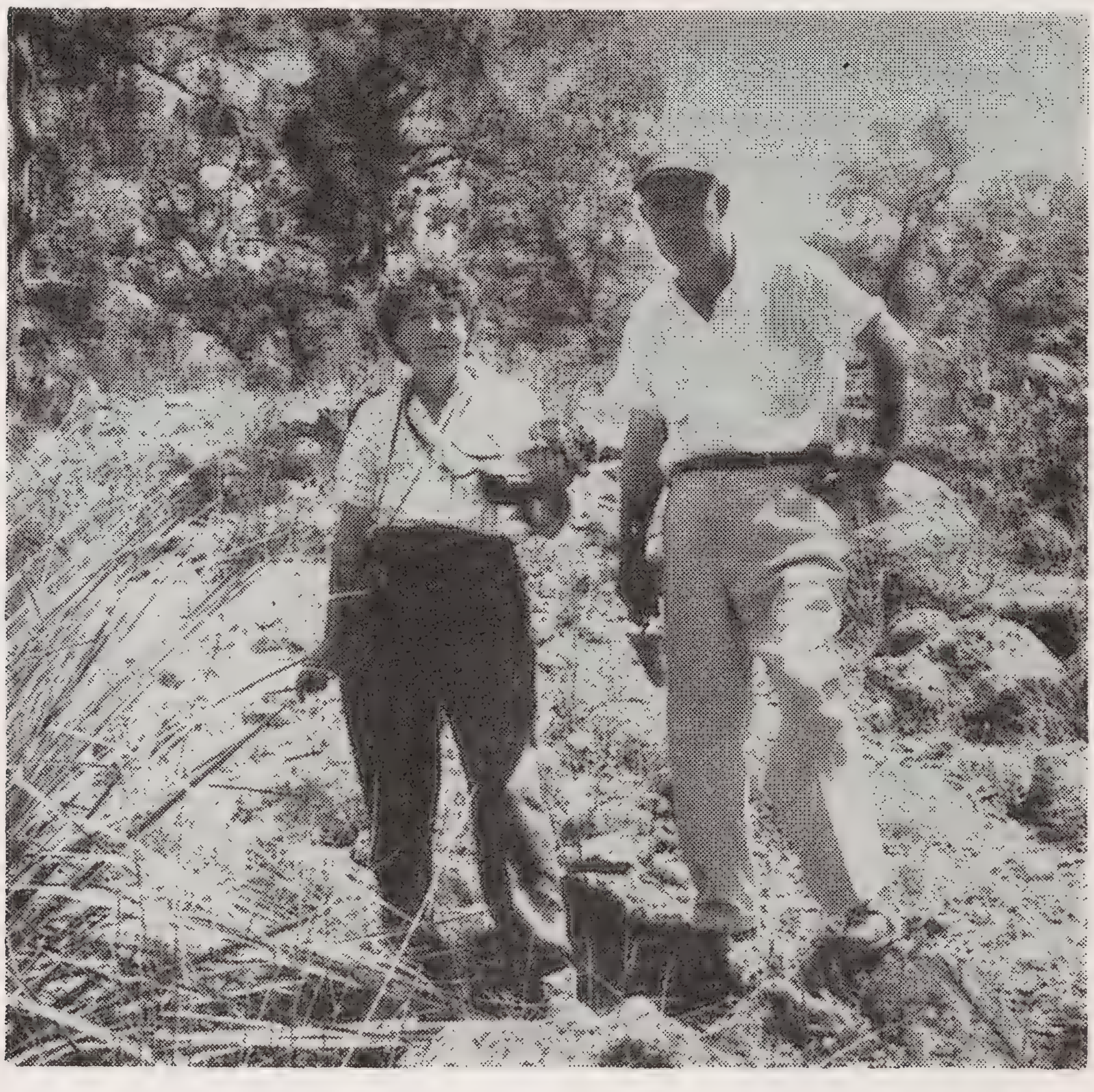

Fig. 5. Kitty and Morris Clint near the discovery site of *Zephyranthes clintiae*. Photo—Fred B. Jones.

one who wishes. There may be limits to this trespassing which I am unaware of, nevertheless, it is still possible to select one's location and stop and collect without fear of being ''run out.'' As everyone knows, this is no longer possible in many sections of the United States. Rarely does one see a ''No trespassing'' sign in the Mexican rural areas, and may the day of its arrival be long delayed!

I was constantly impressed by the seriousness with which the Clints take their plant collecting. They obviously have a wonderful time at this game, yet, they never go about it in a haphazard or hit-or-miss fashion. Each trip is preceded by days of study and preparation which includes the setting up of goals or objectives. On our 1954 expedition, the major objective was the finding of *Zephyranthes concolor,* that handsome yellow-flowered species which, so far as we could learn, none of the present generation of bulb enthusiasts had seen (See HERBERTIA, 1955). On the 1955 trip (that is, the May trip, for the Clints make more than one trip to Mexico each year), there were apparently several equally-stressed objectives, and the itinerary was planned accordingly. Thus there was a colony of a wide-leafed species growing along a certain stone fence in Guanajuato state, and these bulbs had not been seen in bloom in the wild; it was hoped that they would be blooming on the particular day when we would reach their location. Had they been in bloom, a complete pictorial record would no doubt have been made. Farther on, we hoped to find in the mountains of Hidalgo state, along the winding Pan-American highway, flowers of a species known only from its bulbs and foliage—a foliage distinct from that of other Mexican amaryllids. As it turned out, this particular bulb was blooming rather profusely. Climbing over the steep, rocky slopes trying to find a few bulbs not hopelessly imbedded in the rock crevices, I think we all had the same feeling of wonder and fulfillment which we had experienced the year before when we found *Z. concolor* on the desert plateau. For me, at least, the finding of this white species in bloom was the high point of the second trip.

Returning to the preparation that precedes a collecting trip, I noticed that all is planned, even to the smaller details, well in advance of crossing the Rio Grande. Road conditions are investigated, weather information is studied and reservations are made if the tourist traffic is heavy. The drive which is to be made each day is plotted carefully, ample time being allowed, needless to say, for plant-hunting along the way, and also for a stop under some convenient tree for lunch (not that we always found a tree, however). On the rear seat of the car is placed a big box of food and other necessities which would come in handy in case of a forced delay on the highway. In this connection, I never tired of listening to stories about an unavoidable overnight stay on the unpaved ''Tula road.'' This was years ago and the Clints rarely leave the main highways now.

After digging several bulbs of each form or variety which may occur at a location, the notebook is brought out and a stack of paper bags made ready. Never is a location left without recording the essential field data. This includes, of course, the distance from nearby towns or cities, the altitude, date, type of soil, etc. After removing foliage and adhering soil, the bulbs are dropped into the paper bags, each sort going into a separate bag which is then numbered. This same number goes into the notebook and later is inscribed on the marker indicating where the bulbs are planted. If at all possible, pictures are taken of bulbs which are in bloom, or of foliage which is thought characteristic or even of a habitat. By taking along two cameras, pictures may be taken in either black and white or in color.

After having passed quarantine, the bulbs are ready to be planted out in the trial plot which is located on the Clint ''farm'' on the outskirts of Brownsville. This tract, which has a considerable number of acres in it, slopes gradually down to a ''resaca'', which is one of the characteristic water courses of the lower Rio Grande valley; a part of this acreage is still covered with a dense growth of ebony, acacia, mesquite, etc. which forms an attractive background to the trial plot and the other improvements which have been made nearby. The plot itself is not large, yet even now there is room in it for many hundreds of bulbs, succulents and other plant materials. It is laid out geometrically, with walks of Mexican paving blocks, and as I recall, there is a gentle slope even here; the soil is a fine sandy-loam which lends itself to the cultivation of a wide range of plants and certainly is an ideal one for bulbs. Everything is planted in short, straight rows, each form and variation clearly labeled, the entire planting in perfect order.

As a direct result of the collecting activities of Morris and Kitty Clint, I feel certain that a great deal more is going to be known about the bulbs of Mexico. Not merely because they are bringing back for study many sorts which have been hard to lay hands on, but because they are going about their work in a scientific manner, making the observations and taking the notes which are so important to those who later on will study these plants. In time, no doubt, the varieties of outstanding merit will become available to anyone who is interested in growing them. Thus far, collecting has been confined mainly to Eastern and Central Mexico; but at this writing I receive news that they have for the first time visited Guadalajara and Morelia, cities far to the west and south. I look forward to the day when they will have explored for bulbs in the farthest reaches of the Republic, particularly in such remote regions as Oaxaca and Yucatan. I believe that time will come. Then their trial grounds will bulge with interesting and surprising species not yet seen by many of us, and I wonder if anywhere in the world will there be growing and blooming in one place, so extensive a collection of the bulb riches of Mexico?

Zephyranthes lutrae Hort. ex Pam, nomen subnudum

In Herbertia 7: 40. 1941, Major Pam publishd the name *Zephyranthes lutrae* Hort. ex Pam, *nomen subnudum,* without giving an adequate

[**Zephyranthes lutrae,** continued on page 24.]

BOLIVIAN FORM OF AMARYLLIS BELLADONNA L., AND ANOTHER **AMARYLLIS** SPECIES OF THE SAME AREA

Ira S. Nelson, *Southwestern Louisiana Institute*

In the 1954 volume of Herbertia, I made a brief report of the Bolivian plant-collecting expedition sponsored by the Louisiana Society for Horticultural Research. Mention was made of collecting a series of *Amaryllis* which varied in flower color from cream to pale yellow, many of which developed a blush after opening. This series greatly resembled *A. belladonna* L., in flower conformation and size. *A. belladonna* L., was collected at the same time and often in the same area. I was unable to get notes on vegetative characteristics while in the field because the foliage was either dormant or was just starting growth.

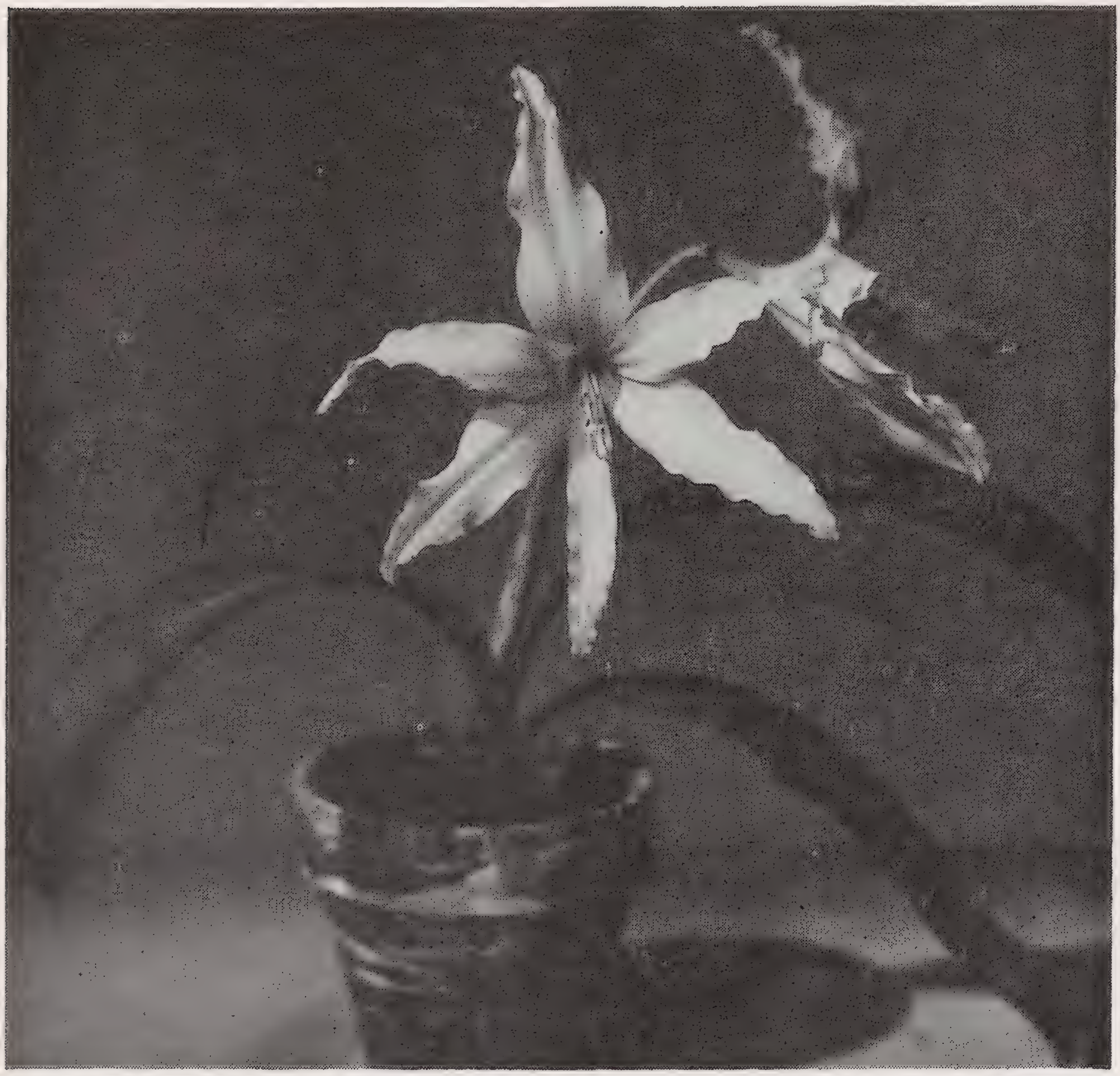

Fig. 6. Unidentified *Amaryllis* sp., from Santa Cruz, Bolivia, growing in 4-inch pot. Scapes on other plants are normally about twice as tall. Photo—Ira S. Nelson.

During the past year I have had opportunity to examine the vegetative characteristics of these plants. Unfortunately so few of them have bloomed that we must await still another flowering season before they can be identified. Several vegetative characteristics in these two types now appear to be distinct.

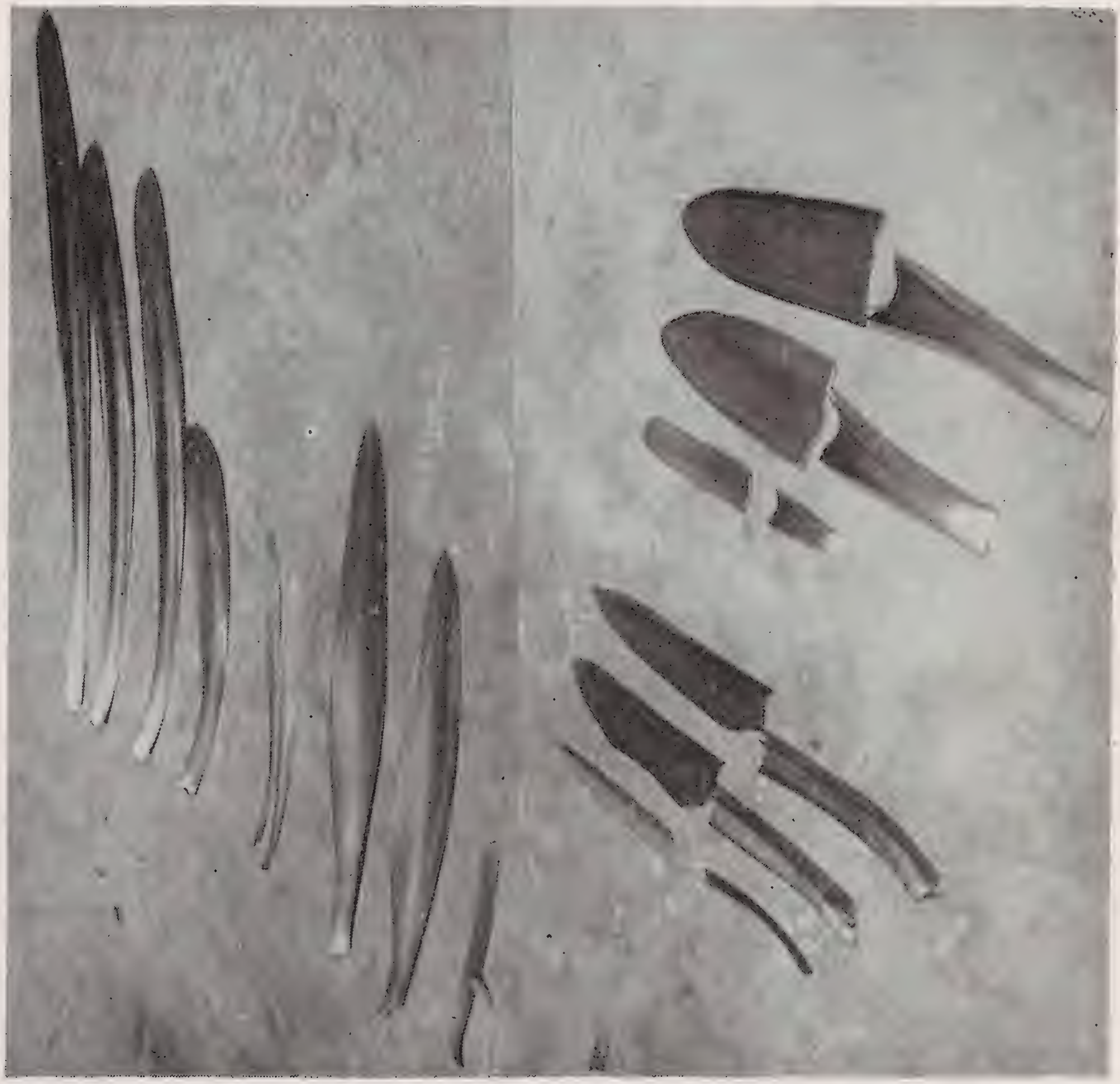

Fig. 7. Bolivian **Amaryllis** spp. (groups on left hand side; entire leaves) upper 6 leaves from **A. belladonna;** lower 4 leaves from "Crucenian" sp. Two smallest leaves in each group from 5 month old seedlings; all others from mature bulbs.

(Groups on right hand side; basal and tip portions of leaves) 3 leaves each of **A. belladonna** (lower) and "Crucenian" (upper) which are broader. Photo—Ira S. Nelson.

In order to distinguish between the two, I will refer to the unidentified type as the Crucenian *Amaryllis*, which designates Santa Cruz, Bolivia, as the area in which it was found.

Generally speaking, *A. belladonna* L., produces more leaves per bulb than does the Crucenian plant (Fig. 6). Also its leaves are longer, narrower and a darker green. The foliage of the Crucenian *Amaryllis* has more pronounced veins. It seldom exhibits any red color at the base of the leaves as does *A. belladonna* L., from the same area.

Some leaf measurements are recorded in table 1-I. The 12 plants measured were selected at random from many growing in 4 inch pots. The length and width of both the longest and the widest leaves are given. These measurements overlap somewhat but the length-width index in each of the two groups is distinct. This index is expressed numerically by dividing the leaf's length by its width. An examination of table 1-I reveals that the *A. belladonna L.,* leaves measured were on an average 17.4 times as long as they were wide, while the Crucenian series were on an average only 8.3 times as long as they were wide. Plants with larger bulbs, grown in six inch pots, retained approximately the same length-width index as those shown in table 1-I.

Table 1-II gives the bulb measurements of the same plants that were recorded in table 1-I. In both groups most of the bulbs were slightly longer than they were wide. Exceptions were present in both groups.

TABLE 1. Comparison of foliage, bulb size and reproductive records of a Bolivian form of **Amaryllis belladonna** L., and another species (unidentified, and indicated as "Crucenian" species) from the same area (Santa Cruz, Bolivia).

Characters measured:	Range and average based on measurements from 6 plants * "Crucenian" **Amaryllis** sp.		Range and average based on measurements from 6 plants * **Amaryllis belladonna** L.	
	Range:	Average:	Range:	Average:
I. FOLIAGE:				
Number of leaves per bulb	3 — 7	5	5 — 8	7
Length of longest leaf, cm.	28.6—38.6	34.3	34.5—49.7	44.2
Width of longest leaf, cm.	3.0— 4.5	3.7	1.8— 3.4	2.4
Length-width index of longest leaf	6.6—11.5	9.2	14.5—25.9	18.4
Length of widest leaf, cm.	24.8—37.0	30.4	32.5—49.7	40.8
Width of widest leaf, cm.	3.5— 4.9	4.1	2.1— 3.4	2.5
Length-width index of longest and widest leaf	5.0—10.6	7.4	14.4—19.5	16.3
Average length-width index of longest and widest leaves	5.8—11.0	8.3	14.6—21.1	17.4
II. BULB SIZE AND REPRODUCTIVE RECORDS:				
Bulb length, cm.	4.2— 6.0	4.9	3.7— 4.0	4.2
Bulb width, cm.	4.2— 5.2	4.7	3.1— 4.5	3.7
Number of rhizomes	4—13	6.5	—	—
Number of new bulbs	1— 7	4.2	0— 1	0.8

---

* The measurements were taken from 6 individual plants of the species.

In all cases observed *A. belladonna L.,* either produced no new side bulbs or produced them immediately ajacent to the mother bulb as do commercial hybrid *Amaryllis.* The Crucenian *Amaryllis* formed new bulbs almost exclusively on the ends of rhizomes which arose near the joining line of the basal plate and the bulb scales. In some cases the rhizomes enlarged close to the parent bulb and formed a bulb, but continued terminal growth in the form of a rhizome until the growing tip became exposed at the surface of the soil. They then produced another bulb. Some of the rhizomes coiled around the inside of the pots and never reached the surface. These had not formed bulbs when examined.

It is significant that rhizomes formed on all of the Crucenian *Amaryllis* bulbs and that no rhizomes were present on any of the bulbs of *A. belladonna* L. This is true of all plants examined which number about 100 of each. More than half of the rhizomes which developed on the Crucenian *Amaryllis* formed new bulbs on their tips by November 1, 1955.

Of the plants listed in table 1-II, the Crucenian *Amaryllis* produced an average of 4.2 new bulbs per plant while *A. belladonna* L., produced an average of only 0.8 new bulbs per plant. This sample although small, is typical of plants growing in four inch pots. Larger bulbs growing in six inch pots produced a greater number of new bulbs per plant; however the reproduction ratio between the two types remained about the same. When the Crucenian *Amaryllis* were collected very few rhizomes were found. This indicates that the rhizomes disintegrated after the new bulb was formed and before flowering the following year.

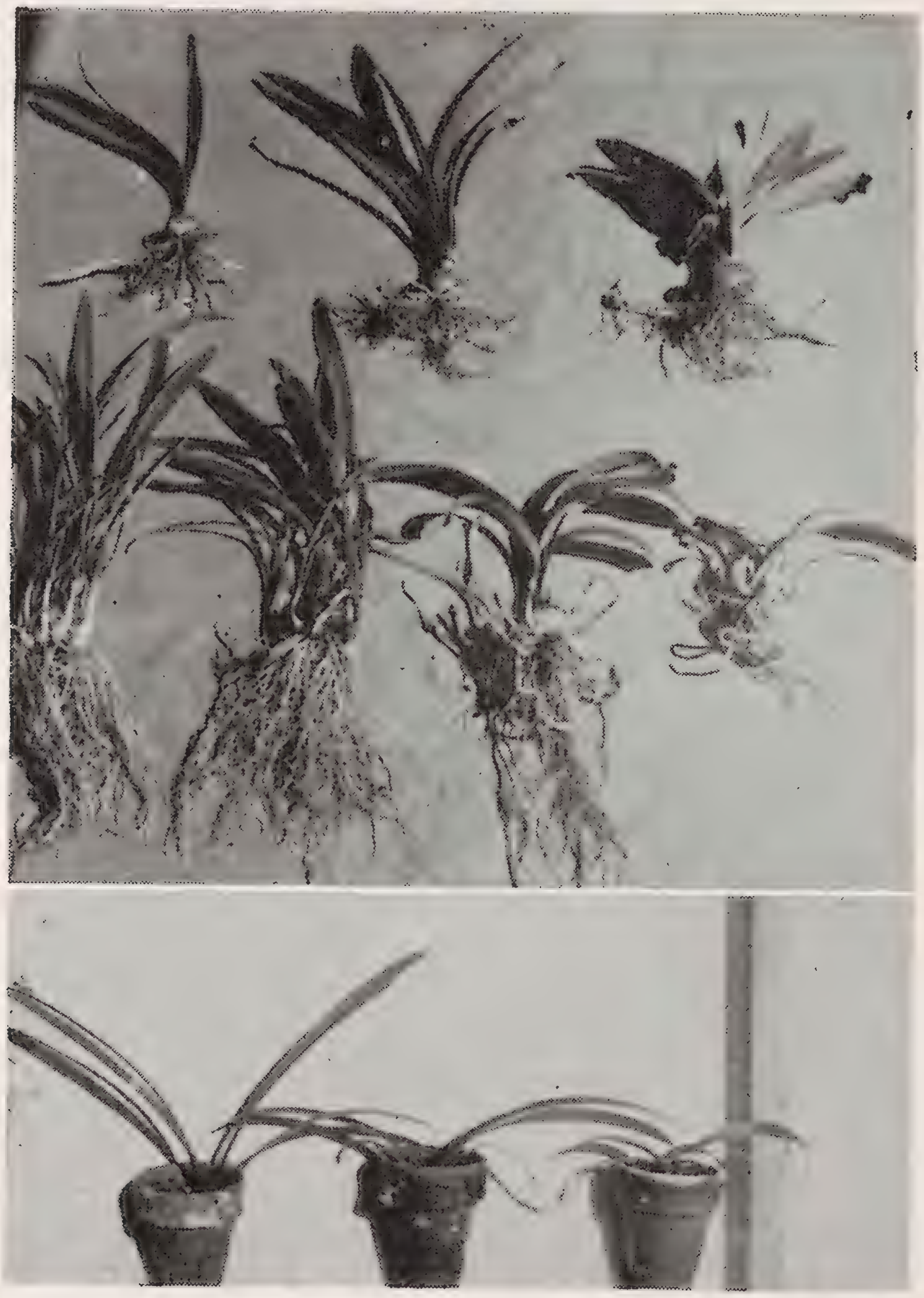

Fig. 8. Bolivian **Amaryllis** and hybrid: (a) top row, grown in open bed (left to right) "Crucenian", **A. belladonna,** and "Crucenian"; (b) center grown in pots (left to right), 2 clumps **A. belladonna** (in 6-inch pot), "Crucenian" (in 6-inch pot), and (in 4-inch pot); (c) bottom row, seedlings 5 months old in 2-inch pots (left to right) **A. belladonna,** hybrid (**A. belladonna** x "Crucenian") and "Crucenian". Photo—Ira S. Nelson.

One mature seed pod was found at the time the plants were collected. The seed was sent back and was planted in November 1954. Nine seedlings from the pod are now one year old and 5 of them have already produced rhizomes with new bulbs on their tips.

Crosses between *A. belladonna L.,* and the Crucenian *Amaryllis* were made last spring. The Crucenian *Amaryllis* seedlings are conspicuous by their relatively wide foliage and flat leaf posture. The hybrids exhibit narrower foliage more nearly like *A. belladonna* L., but have the prostrate leaf posture of their Crucenian parent. (See Fig. 8.)

It is the opinion of the writer that the Crucenian bulbs are the most important *Amaryllis* found during the 1954 plant collection expedition. Fortunately they appear to be rapid multipliers which naturally will hasten their release. It is hoped that in the next issue of Herbertia Dr. Traub and the writer can establish the true identity of these interesting Crucenian plants. The Louisiana Society for Horticultural Research has sent bulbs to Dr. Traub but these have not yet bloomed for him.

AN ANDEAN **AMARYLLIS** SPECIES

[Mr. Hannibal brought a single flower of an *Amaryllis* species collected by Dr. Goodspeed in the South American Andes for identification to the writer at Salinas, Calif., in 1944. It was keyed out as *Amaryllis forgetii* Worsley, which is native to Peru, near Cuzco. This identification was tentative since the bulb and leaves had not been seen. The writer has not been able to see complete specimens and thus the identity is still tentative.—*Hamilton P. Traub.*]

(a) REPORT OF MRS. EDITH B. STROUT

Among my numerous acquisitions from here and there, I acquired a bulb marked "Amaryllis forgetii." The bulb is 2 inches in diameter and has a neck from 2½ to 3 inches long. The leaves are 22 to 24 inches long, about 2 inches wide at the broadest spot, acute tips, narrower at the neck and the base of the leaves are colored maroon for 4 inches. The under side of the leaves are a decided gray-green (RHS Spinach Green 0960/3) and the upper sides are a more normal amaryllis type green (RHS 0960). But to me the most noticeable thing about the leaves is how the base broadens into a scale-like protection sheath and wraps itself completely around the neck—in fact forming the neck of the bulb. All of the amaryllis seem to do this to some extent, but these are more pronounced than other bulbs which I have and seem more like a *Clivia* in this respect.

This bulb bloomed for me in May, having a peduncle 19 inches tall, maroon at base and fading into all green at the top (Fig. 9). Spathe valves were 3½ inches long, purplish or maroonish. Pedicels were short, 1⅛ inches, and there were 2 bells, ascending, which measured 7 inches from top to bottom, 6½ inches across the 2 upper petepalsegs. The setepalsegs measure 1⅞ inches, the petepalsegs 1½ to 1⅝ inches, while the lower petepalsegs is 1⅜ inches wide. The tepalsegs start to twist or crinkle somewhat like a cyclamen but are only slightly reflexed.

The color is a Cardinal red (RHS 822) quite uniform, deeper red veins, velvety in appearance with a deep, rich red substance. There is an Agathia Green star (RHS 60) on a third of the limb, which was outlined with an iridescent cardinal red band with what I call an "overlay of purple." That is, when seen in some angles, there is a definite purplish cast or tone, but move an inch to the side and only the red is visible. This characteristic always reminds me of the iridescent taffetas which used to be, and again seem to be coming, in vogue for party dresses.

The tube was ⅝ inches. Filaments and pistil were the same Agatha green in the throat for the length of the star, then Cardinal red to the tips. Pistil was ½ inch longer than the limb, and dripped nectar almost continually. The anthers were purple before maturing.

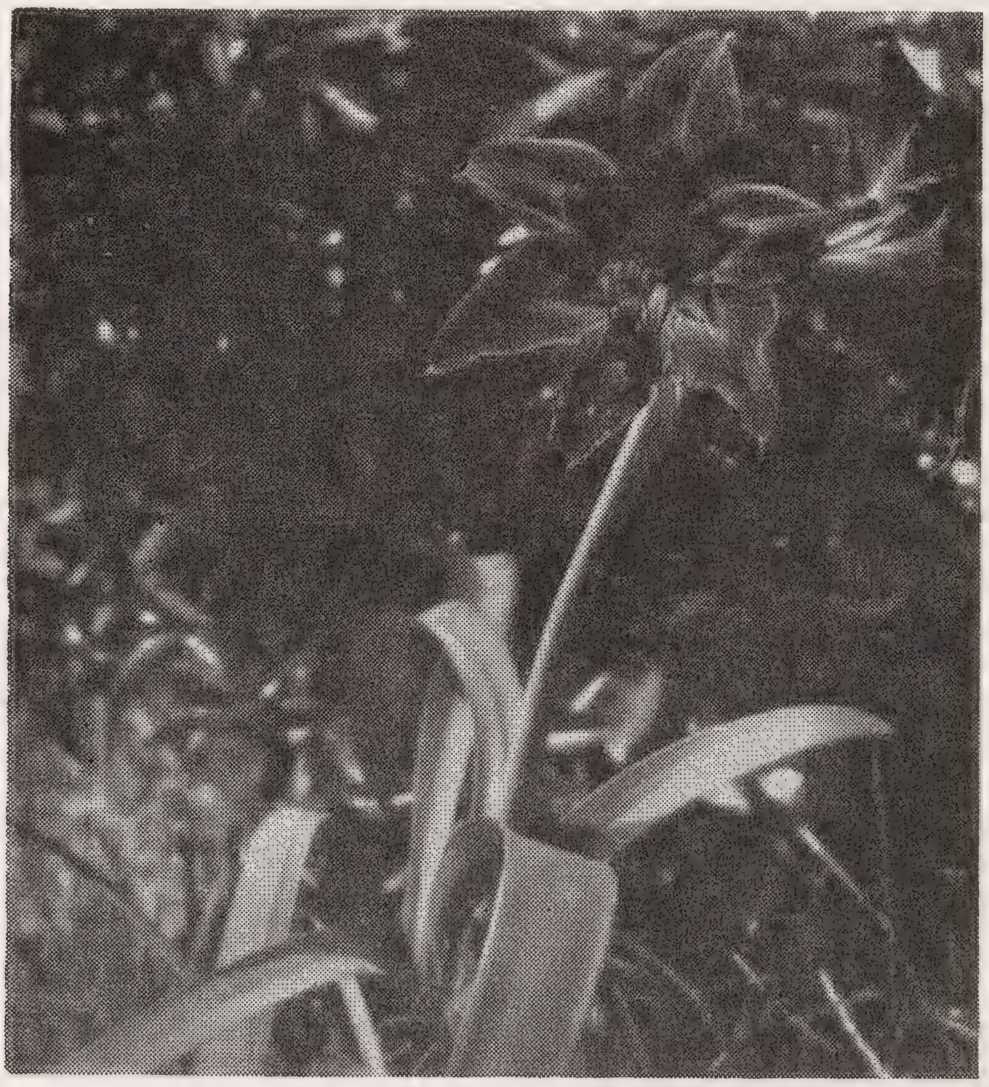

Fig. 9. Unidentified *Amaryllis* species collected by Dr. Goodspeed in the Andes. Photo—Edith B. Strout.

This species seems to belong to the Omphalissa sub-genus, in which the corona or paraperigone closes in the throat. One could say that the "eye" seemed to be formed by hairy sheets or appendages on the tepalsegs which formed a very narrow opening through which the filaments and pistil had to push their way out, like a trap door to keep out insects. It made me think most of all of the paper hoops through which circus performers jump and the filaments seemed to be pushing their way through thin encircling membranes.

It did not set seeds, either with self pollinization or with pollen from other hybrid amaryllis. For me it seems to prefer a sandy soil.

The bright red tepalsegs and green star form a striking, nearly startling, contrast. As the outside of the tepalsegs has the same color arrangements, the bloom will catch anyone's attention seen from any angle. The twisting tepalsegs are very graceful and add that much needed and valuable ingredient—variety. Its ascending bells also give it a pert air and I found its simple deviations from our more formal hybrid amaryllis to be very refreshing.

(b) REPORT OF MRS. PAUL A. KANE

This species amaryllis, tentatively identified as *A. forgetii,* came to my garden from California. Its first location in my garden was in deep shade. The soil was pure leafmold and quite damp. It was the type of garden bed in which we grow coleus, caladiums and other shade and moisture loving plants.

The bulb flourished and increased somewhat, but did not flower. After some years it was decided that the space could be given over to something more productive of bloom. Space in this garden is at a premium and plants must pay their way in color or leaves.

So, the bulb clump was relegated to a very dry spot of sandy soil on the east side of the house. Protected from rain by wide, overhanging eaves, only a driving rain would reach it. There are not very many heavy, driving rains in San Antonio in a year, so that I believe if it got moisture more than once a month it was unusual.

Much to my surprise I found several scapes rising from the clump, in late July. This seemed an odd time for an amaryllis to bloom. However, with one exception, it has bloomed at this time of the year ever since. This year it bloomed in early June. In mid-May we had had the heaviest rainfall, over a period of some days, in many years. Since other bulbs are also blooming out of their usual time it must have been the extra rainfall.

The scape is about 25 inches in height with two to three flowers. These are bright red with a deeper spot of red towards the base of the tepalseg. The tepalsegs do not recurve but are slightly twisted.

In spite of hand pollination it is not self fertile and pollen saved from hybrid Dutch type amaryllis was either not fresh enough or not acceptable. To date it has not kept a seed pod, these fall off after a few days.

(c) REPORT OF L. S. HANNIBAL

The bulb tentatively identified as near *A. forgetii* was one of several given to the writer by Dr. Goodspeed out of his collection from Andes. Dr. Goodspeed made several plant hunting trips down into the Andes some 15 years ago and collected a large number of herbarium specimens and living bulbs of plants allied to or belonging to the Amaryllidaceae. Just where the above tentatively described bulb species was found is not known, although such probably could be determined by going over the herbarium material. It first flowered in 1944, and a single blossom was given Dr. Traub who was then living in Salinas. He keyed it out tentatively as the above named species. Offsets were distributed to several collectors.

No seed were ever set. However, since that date much has been learned regarding self sterile plants, and now presumably by using elevated temperatures and mixed pollens seed would be obtainable. The behavior of the bulb suggested that it grew in a warm damp location in part shade, and rarely if ever had a dormant period. It was not happy in the San Francisco Bay area due to the cool nights and overly damp winters. The writer lost his bulbs to the ravages of the 'Lesser Bulb Fly' which prefers some *Amaryllis* in lieu of Daffodils.

NOTES REGARDING **BLOOMERIA HUMILIS**

ROBERT F. HOOVER

[The reader is referred to pp. 21-22, PLANT LIFE 11: 1955, where *Bloomeria humilis* Hoover was first described.—*Editor*]

The occurrence of *Bloomeria humilis* at a second locality is to be reported: two miles north of Arroyo de la Cruz on State Highway 1, San Luis Obispo County, California, June 14, 1955, *Hoover 8357.* The presently known range of the species, doubtless significantly, coincides with that of another localized endemic, *Ceanothus maritimus* Hoover (see Leafl. West. Bot. 7: 111—112. 1953).

Living plants from the above cited locality and in cultivation were compared with *B. crocea* var. *aurea* (Kell.) Ingram as it occurs at San Simeon, not far from the occurrence of *B. humilis,* and at San Luis Obispo. Comparison with fresh flowers of *B. crocea* var. *montana* was also made. The only error worthy of remark in the original description of *B. humilis,* which was drawn up from dried specimens, is found to be one of measurement. The lower portion (appendage) of the filament before drying ranges from 3 to about 4.75 mm. long, and the upper portion (filament proper) from 5 to 7 mm. The length and conspicuousness of the lower portion is the most noticeable difference from *B. crocea* in the fresh flowers. In *B. crocea* the structure is hardly more than a cup surrounding the base of the filament and can there quite properly be termed an "appendage."

The observation that the lower portion of the filament may be either papillose or smooth in *B. humilis* is confirmed by study of the fresh flowers. In different plants it varies from rather densely papillose to virtually not at all so. The papillae when present are generally less prominent than in *B. crocea* and mostly confined to the margins toward the base.

None of the wild plants of *B. humilis* seen this year had two leaves or offsets from the corms,—both of which features are frequent in cultivated plants of this species. This fact, together with a parallel situation in certain other species, leads me to believe that the production of offsets is often a response to favorable environmental conditions rather than a genetically constant character. For example, this year I have found offsets in cultivated plants of *Muilla Clevelandii, Brodiaea elegans* var.

mundula, Brodiaea minor var. *nana,* and certain strains of *Brodiaea coronaria,* none of which had been observed to produce them before. Nevertheless, there remain several species which seem unable to form offsets in any environment. Vegetative reproduction has still never been observed or reported in *Bloomeria crocea,* so that the capacity to produce offsets, rather than their actual presence, may be regarded as distinctive of *B. humilis.*

DOUBLE **AMARYLLIS** CULTIVATED IN INDIA

WYNDHAM HAYWARD, *Florida*

Double Amaryllis, that is, double in the sense of a full double flower, in which the filaments are distorted into more or less extra petalage and sometimes a compact frilly form of bloom, as in the 'Kwanso' daylily, and various double *Narcissus,* have been known since Dean William Herbert's time.

Amaryllis albertii, Lemaire was published in the Illus. Hort. plate 498, in 1866. Herbert made his first reference to a double *Amaryllis* in his Append. Bot. Reg. 31, 1821, and again in his "Amaryllidaceae," 1837—*Amaryllis equestris* var. semi-plena. In this he made it a variety of what we know as *Amaryllis belladonna,* Linn., the West Indian red Amaryllis.

In this connection it is worth while to quote from Dr. Henry Nehrling, "Die Amaryllis," Berlin, 1908,—

"In Cuba and the other West Indies Islands and in gardens of Florida one also finds double Amaryllis, *A. alberti,* Lemaire, (Ill. Hort. F. 498) . . . Baker maintains in his handbook of the Amaryllideae that it is a variety of *reginae,* but I have found that it is similar to the *A. equestre* in growth and entire dissimulation."

A photograph of *A. albertii* appears on page 103 of the 1950 HERBERTIA. The writer has personally received bulbs from Puerto Rico in the West Indies. Herbert in 1837 reported his *Amaryllis equestris* var. *semi-plena* had been "found by Fraser in Cuba near Havanah, and adds: "imported also from Bahama."

In spring of 1955 the writer received from an Indian nursery firm, a number of which are located in the vicinity of Kalimpong, North Bengal, a photograph of a "new" double *Amaryllis,* (Fig. 10), which has been cultivated in some part of Sikkim and North of Bengal. There must be a large quantity of these double *Amaryllis* available, as they were quoted by the thousand. A dried specimen of flower was also received and promptly forwarded to Dr. Hamilton P. Traub, who examined it critically and reported that it was apparently a less double form than *Amaryllis belladonna* var. *albertii* and should be identified with Herbert's *Amaryllis belladonna* var. *semi-plena.* (See Fig. 10.)

The reported "discovery" of a quantity of cultivated double Amaryllis in North India is not surprising. A number of families including several named Chandra, a common name in Nepal, have engaged in the nursery business in the Kalimpong area and Sikkim State for many decades. They have proved to be a reservoir of many valuable plants and bulbs which might otherwise have been lost in Europe and America during the enforced neglect of World War I and II days.

Some of these nurseries go back at least 50 to 75 years, and were trading in bulbs and plants with Western growers and dealers 50 years ago. It is known that the late Dr. Nehrling supplied them with *Amaryllis, caladiums* and Gloriosa and possibly other bulbs. When grown in a suitable warm climate, not subject to frosts, the *Amaryllis albertii* and doubtless other doubles grow well and multiply, just as they do on the lower East Coast of Florida where frosts are virtually unknown. In Central Florida results have not been so successful, as the winter frosts seem to damage the bulbs systematically and retard the growth even when planted some inches underground.

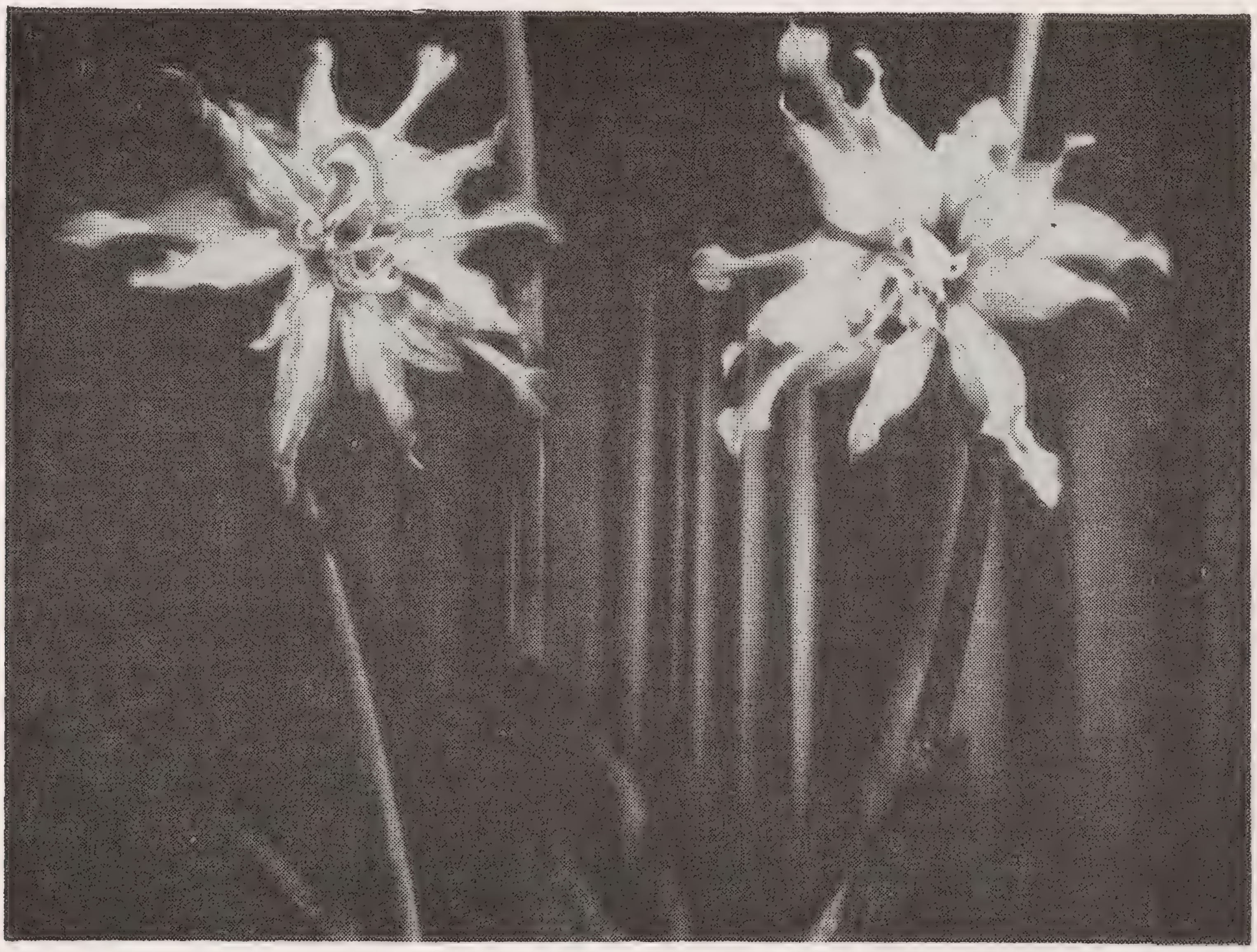

Fig. 10. *Amaryllis belladonna* var. *semiplena,* a semi-double form cultivated in Sikkim, India. Photo—Standard Nursery, Pakyong.

A few bulbs of *Amaryllis albertii* or *A. belladonna* var. *semi-plena,* might well propagate naturally to many thousands in 50 or 75 years time in some warm-climate garden of a maharajah's estate in the warm valleys of the Himalayan foothills. Or in a similar location in Assam or the Brahmaputra valley.

It is hoped to obtain some of the bulbs for further study, on the chance that they may prove to be a distinct variety in double form as yet unknown here.

MISS HENRY'S SOUTH AMERICAN COLLECTING TRIP

Editorial note:—During the year 1955 Miss Josephine Henry, of Gladwyne, Penna., made a plant collecting trip, particularly for amaryllis. The following excerpts from letters received will interest the readers:

Under date of November 4, 1955, Miss Henry writes from Lima, Peru,—

"On Sunday, October 30th, I went to the market at Huras after lunch. I bought some lovely woven bags and belts, and then strolled through the place looking for purple potatoes. Suddenly I noticed a bunch of pink *Amaryllis* with blackish maroon stems! They were a bit wilted, but stunning. They lay among potatoes! Never having seen anything like them I began making inquiries in my scanty Spanish. A friend, who was with me, could not understand why I was so anxious to get bulbs. The little Amerindian woman said that they grew a very long way off,—Nicrupampa or Negropampa above Huras. I bought two blossoms to press. They told us that we could not go to the place in a car, but a little way. Still further inquiries indicated that it was between three and four kilometers, which is as nothing by car. We had first asked the woman if she could have some bulbs brought to the market by Monday morning, but she said that Tuesday would be the earliest. By that time it would be too late.

The Amaryllis flowers were bright pink, with pink stripes radiating into the white tepaltube which was light yellow at the base, and they had some fragrance. The peduncles are up to 18 inches tall, and the flowers are 3 inches across. The last half inch of the filaments and style is bright pink. The pollen is cream-colored. The more I looked at these bright pink flowers, the more eager I was to obtain bulbs.

In the morning I returned to the market on the chance that there might be some bulbs of the pink *Amaryllis* for sale, but there was no sign of any bulbs. However, I did see a few flowers of the Pink Amaryllis in another shop. Again, I was told that it grew a long way off. We inquired further, and were told to cross the bridge and turn right on the road which leads to the brewery where we could leave the car and walk the remainder of the way. This we did and found ourselves walking between adobe walls on granite foundations which surrounded the little farms. We were the cause of much amusement among the Amerindians living there, but they are very nice. As we progressed we continued to ask if any one had seen these flowers, and we were informed that this was the general area where the pink Amaryllis was native. Finally, we came up to a man who was washing his socks in the acequia or irrigation ditch beside his wife, who was washing clothing. He knew that they grew above, and said that it would take three hours to get some bulbs. Their idea of time is not too accurate, and having a very bad headache I was not too eager to climb an unknown distance. He agreed to have three bulbs by four o'clock, he came down the mountain with eight large bulbs just as we returned at four o'clock.

Upon reaching Lima, I called on Dr. Ferreyra at San Marcos University, and he said that he had never seen anything remotely resembling this *Amaryllis* species! It has four to eight flowers per umbel. He is drying some specimens which will soon be on their way to you for description and identification. Also some bulbs are on their way to Gladwyne.

I will keep my eye open for more *Amaryllis*. This country is beautiful and very fascinating. Dr. Ferreyra wished to be remembered to you.''

Hotel Carrera, Santiago de Chile,
December 10, 1955

''Enclosed is a little thing of a lovely shade of shrimp pink which was growing about the town known as Los Vilos. Yesterday I passed through there and even though the sky was heavily overcast, these lovely shades of pink were wonderfully pretty. I got a number of bulbs. They are 5 cm. in diameter and very round, but they have a neck about six inches long and it and the bulb are *very* dark.

''About ten miles east of La Serena one of the bell boys from the hotel went with me and we got some seed stalks of an *Amaryllis* known locally as *A. añañuca* (= *Rhodophiala añañuca),* but naturally I do not known if it is that or *A. bagnoldii* (= *Rhodophiala bagnoldii).* They were growing on an almost bare granite grit knoll, with almost nothing but cactus for company. They claimed that the flowers are red or yellow. Time will tell us much more. ''. . . Some more bulbs have been sent to mother from Peru. Some bulbs from Abancay, one a tiny amaryllid, and the other a fair sized one, but I could find out nothing as to the flower color or blooming habits.''

[Editor's note.—In her Air Mail letter, Miss Henry enclosed a pressed specimen of the plant from the environs of Los Vilos which came through in fair condition. This will be preserved for comparison with the plants as grown under cultivation. It shows a short peduncle, two narrow spathe-valves, and a four-flowered umbel, with pedicels varying greatly in length. The stamens are shorter than the tepalsegs, and the style is shorter than or subequals the tepalsegs. The stigma is trifid. This comes very close to *Rhodophiala chilensis* (syn.—*Amaryllis chilensis* L'Hérit.) of which we have only the yellow-flowered form in cultivation at present. According to the published description there is also a bright red form. However, only a closer examination of the living material will make clear just where it belongs.]

THE LECTROTYPE OF **LYCORIS STRAMINEA** LINDL.

HAMILTON P. TRAUB, *California*

In 1845, Fortune sent to Kew Gardens, England, from China, a plant which Lindley named *Lycoris straminea* Lindl., in the Journal of the Hort. Soc., London, *3:* 76. 1848. Lindley gave an inadequate description and the name was in fact a *nomen subnudum.* With this in the way, it was not possible to identify a number of *Lycoris* species recently imported from China and Japan. There was always the possibility that one of these might turn out to be *Lycoris straminea* Lindl.

For over a decade attempts were made to locate the type specimen of *Lycoris straminea* Lindl., but without success until 1954. Finally, through the kindness of Dr. S. M. Walters, Curator of the Cambridge University Botany School Herbarium (CGE), the type material was located. Dr. Walters kindly sent a photograph of this material which is now available for study. Dr. Walters remarks: ''As you can see, the two specimens on the sheet differ rather significantly in the length of the tepaltube, the right hand one having the order of 1 cm., whilst some at least of the flowers on the left hand one are only a few millimeters.''

According to Lindley, *Lycoris straminea* Lindl., has a very short tepaltube and thus he apparently based his description on the specimen on the left hand side of the sheet which is hereby designated as the lectotype of that species.

It now remains to put on record an emended description of the species on the basis of the inadequate one of Lindley, and the details that can be made out from the designated lectotype.

Lycoris straminea Lindl., **emend.** Traub.

Lycoris straminea Lindl., in Jour. Hort. Soc. Lond. *3:* 76. 1848, *nomen subnudum.*

EMENDED DESCRIPTION.—*Bulb* and *leaves* unknown; *peduncle* up to 22.1 cm. tall, 6.6 mm. in diam., at the base, narrowing toward the apex; *spathe-valves* 2, lanceolate, 2.4 cm. long; *umbel* 5-flowered; *pedicels* 1.1—1.3 cm. long; *ovary* 5.8—6.6 mm. long, almost spherical; *perigone* pale straw-colored with a pink line along the middle of the tepalsegs, and a few scattered red dots; *tepaltube* 4—5.5 mm. long; *tepalsegs* linear-oblong, undulate, 3.5—4.1 cm. long, up to 5.2 mm. wide; *stamens* and *style* much exserted from the perigone; *stigma* pointed. Habitat: China; collected by Fortune in 1845.

M. E. JONES **HYMENOCALLIS** SPECIMENS

Hamilton P. Traub and Robert K. Vickrey, Jr.*

Examination of the plant specimens in the Pomona College Herbarium on which *Hymenocallis jaliscensis* M. E. Jones (Contrib. West. Bot. no. 18. p. 33. 1933-35) was based shows that two different species are included in the description given. The type and isotypes from Salsillo, Mexico, and a different and larger plant from La Paloma. Not only did Jones base his description on material from two distinct species, but he also averaged the measurements from these different plants. Thus the tepaltube is indicated as 7.5 cm. long, but the tepaltube of the smaller species (type and isotypes of *H. jaliscensis* M. E. Jones) is actually 6 cm. long in the type, and 5 cm. long in the isotypes. The tepaltube in the larger plant is 12.8 cm. long. Thus the value, 7.5 cm. as reported by Jones was apparently arrived at by averaging the five values, and should be compared with 6.76 cm., the average according to our measurements of the tepaltubes of the Jones herbarium specimens.

Until this error was understood, it was not possible to determine the status of *H. jaliscensis,* and Sealy (1954, Kew Bull. 218) was correct in indicating the anomaly of the longer tepaltube. This confusing situation shows conclusively that in taxonomy when an average value is given, it is necessary also to indicate the actual range of differences encountered.

(a) **Hymenocallis jaliscensis** M. E. Jones, **emend.** (= **H. dillenii** Roem.)

The following description is based on the type and three isotypes, June 1, 1892, Salsillo, State of Jalisco, Mexico, *M. E. Jones* 119,358 (POM), right hand plant (= lectotype); left hand plant (= isotype); and 119,359 (POM), two specimens (= isotypes). Values from the published description (Sealy, 1954) are given in parentheses; identical values are italicized.

Bulb 3-3.5 cm. long, 2.7-3 cm. in diam., sheathed neck 5 cm. long. Leaves 1—*4,* narrow oblong-elliptic, acute, tapering to a petiole-like base, up to 12-14-16.5-20(-23-30) cm. long, up to 0.8-1.4-1.8(-2)-3.3(-3.7-4.6) cm. wide at the widest part. Peduncle produced in June, 16-(-20)-21.5-25.5(-30)-36 cm tall. Umbel (2)-4(-6-8)-flowered. Spathe-valves 1.8-2-3 (-4)-4.5(-5.5) cm. long. Perigone white. Tepaltube (3.5)-*5*-6 cm long. Tepalsegs 4(-5.5-6.7)-8 cm. long. Staminal cup funnel-shaped, *1.5*-1.7-*2*-2.4 cm. long. Filaments *2*(-2.5-3)-4 long; anthers 1.2 cm. long; style overtopping the stamens; stigma capitate; capsule 0.8—1.5 cm. long, containing 2—4 ovate seeds from 4—8 mm. long.

This description agrees well with that published for *H. dellenii* Roem., by Sealy (1954), and apparently *H. jaliscensis* M. E. Jones is conspecific with *H. dillenii* Roem.

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* Formerly of the Botany Dept., Pomona College, now in the Division of Botany, University of Utah.

(b) M. E. Jones, 119,360 (POM) = **Hymenocallis acutifolia** (Herb.) Sweet

The larger specimen, June 9, 1892, La Poloma, State of Jalisco, Mexico, *M. E. Jones* 119,360 (POM) has a tepaltube more than twice the length of that found in *H. dillenii* (syn. *H. jaliscensis*, type 119,358), which indicates that the former belongs to another species. The description that follows shows that it is *H. acutifolia* (Herb.) Sweet. Values from the published description (Sealy, 1954) are given in parentheses; identical values are italicized.

Leaves (6) or *7*, linear-lorate, acute, (30)-33(-62) cm. long, (1.4)-1.8(-2) cm. wide. Peduncle 21.5(-25-38) cm. tall; spathe-valves (5.5)-6.2-(12) cm. long. Umbel (3)-4-(6)-flowered. Perigone white. Tepaltube (7.5-8.5-12)-12.8 cm. long. Tepalsegs 8-(8.5-11-12) cm. long. Staminal cup (2)-3(3.5-4?) cm. long. Filaments (4)-*6* cm. long. Style overtopping the stamens. Stigma capitate. Capsule 1.4 cm long.

As indicated the agreement is very close to that of *H. acutifolia* (Herb.) Sweet and the specimen may be referred to that species.

Acknowledgement.—Thanks are due Dr. Lyman Benson, Botany Department, Pomona College, for re-checking certain critical measurements included in the present report.

HYMENOCALLIS KIMBALLIAE SMALL, EMEND.

Hamilton P. Traub, *California*

In 1933 Small described *Hymenocallis kimballiae* from western Florida. He based his description on a plant collected on the Appalachicola River in northwestern Florida by Mrs. Kimball of Mobile, Alabama. Mrs. Kimball transplanted the species to her garden in Mobile, and it was from this source that Mrs. Mary G. Henry obtained offsets in 1951 which she shared with the writer. The plant has been grown as a tub patio plant in California since 1952, and it developed into a magnificent clump when it flowered on October 20, 1955, at La Jolla. The writer made a new description from living material which amplifies the incomplete diagnosis by Small. In the emended description Small's data is included in parentheses when it differs from the new information, and is italicized when the values are identical in both.

Hymenocallis kimballiae Small, **emend.** Traub

Hymenocallis kimballiae Small, S. E. Flora, 323, 1053. 1933. Holotype collected May 1921 by Kimball (NY).

Bulb ovoid, *large*, without a pseudo-stem. Leaves (on mature bulbs) 6—10, evergreen, thick-textured, furrowed in center on top, deep green, shiny, very narrow hyaline edge, mostly ascending, spreading, 43—58 cm. long, wide lorate in upper part, 5—7—(10) cm. wide, apex acute, sometimes sword-shaped, and narrowing to the base, 3.8—4.4 cm. wide. Peduncle 42 cm. tall at anthesis, *flattened, sharp-edged, glaucescent throughout*, 2.6 cm. in diam. at base, 2 cm. in diam. at apex. Spathe-valves 2, 8.2—10 cm. long, up to 3 cm. wide at the base, tapering to a blunt apex, thin, whitish, soon becoming papery. Bracteoles similar to spathe-valves but smaller. Umbel 8—(9—15)-flowered. Ovary sessile, light green, 1.4 cm. long, 1.4 cm. wide. Ovules 6 per locule. Perigone white and greenish-yellowish in general aspect, tepaltube greenish below, whitish toward apex, tepalsegs white on upper side, yellowish-greenish on underside. Tepaltube 8.7—(12—16) cm. long, 7 mm. wide, *obscurely 3-angled.* Tepalsegs narrow-linear, *involute,* (9—10.5)—11.2—12 cm. long; setsegs up to 12 cm. long, 9 mm. wide, petsegs up to 11.2 cm. long, 10 mm. wide. Staminal cup funnel-shaped, 2.5 cm. long, 6 mm. in diam. at base, (2.5—3)—4.2 cm. in diam. at apex, margins of cup not spreading, irregular, but not distinctly toothed between the filaments (a minute tooth between the filaments according to Small). Stamens and style yellowish in lower part, changing to green in upper part; filaments 6—6.5 cm. long; anthers 2 cm. long, pollen orange-colored. Style overtopping the stamens, stigma capitate. Capsule broadly ovoid, (2.5—3.5) cm. long. According to Small it flowers in summer in its native habitat, and has a fragrance reminiscent of the tea rose.

Type material.—It was collected by Kimball in the estuary of the Appalachicola River in May 1921 and is reported (Small, S. E. Flora, 1503. 1933) to be in the New York Botanical Garden Herbarium but the holotype has not been located up to the present. The specimen—Traub 523a & 523b (one flower dissected)—from cultivated plants (in hort. Traub, La Jolla, Calif.) can be traced back to the original holotype material from which it was propagated by vegetative means. Mrs. Kimball, the original collector, has definitely stated that it was derived by vegetative propagation (offsets) from the living holotype material. Therefore, until the holotype can be located, the specimen, Traub 523a & 523b, may be used as a substitute.

Discussion.—On the basis of Small's incomplete morphological description, Sealy (Kew Bull. 224-225. 1954) reduced *H. kimballiae* Small to *H. latifolia* (Mill.) Roem., but this appears to be untenable in the light of the emended description. *H. latifolia* has a relatively long pseudo-stem (14 cm. long) formed by the bases of the leaves, 2 ovules per locule, and is generally a larger plant with leaves 50—90 cm. long; peduncle 60—80 cm. tall, whereas *H. kimballiae,* under cultivation from 1951—1955 has not developed a pseudo-stem, has 6 ovules per locule, and is a smaller plant with leaves 43—58 cm. long; peduncle 42.5 cm. tall.

Although the number of ovules per locule may vary somewhat in some species, a difference as great as 2 to 6 in this case appears to be significant. This, together with the absence of the pseudo-stem and a generally smaller plant, appears to justify maintaining *H. kimballiae* as a separate species. A comparison of living plants of these two species may reveal other differences of diagnostic value.

Chromosome studies of *H. kimballiae* are being made by Dr. Flory. At present no living material of *H. latifolia* is available, and it is hoped that collectors will provide it for similar studies. Such comparative data should throw further light on the affinity of these two species.

H. kimballiae somewhat resembles *H. tenuiflora* Herb., particularly in having *more* than 2 ovules per locule (3-4-5), but the staminal cup is somewhat smaller and the flowers are more slender in appearance in the latter species. *H. pedalis* Herb. with 4—6 ovules per locule differs from our plant in the shape of the leaves, longer tepaltube and generally larger size of the plant.

DUTCH PURE WHITE HYBRID **AMARYLLIS**

Wyndham Hayward, *Florida*

The Dutch Amaryllis growers maintain a virtual monopoly on the production of ''pure white'' Hybrid *Amaryllis* seedlings and named clones at the present time. No commercial growers or dealers in America are offering pure whites in quantity, either seedlings or named clones, in the trade except those of Dutch production. A few growers are beginning to work up stocks from seed and by vegetative propagation methods, but they are not an important factor yet.

Ludwig and Co., one of the three leading Dutch Amaryllis firms, sell to dealers in the United States an outstanding ''pure white'' Amaryllis currently under the name 'White Giant', their standard white variety, which at its best is a superb form with flowers up to 8½ or nine inches in diameter. The bulbs must be well established and the plants well grown to produce this outstanding quality. Unfortunately very few bulbs become well enough established the first season, in the author's experience to demonstrate this quality. But it can happen.

When well grown, as indicated, 'White Giant' is doubtless as fine a pure white as exists in the named clone field. Close to it is the new white, 'Ludwig's Dazzler', which Ludwig & Co. describes as ''a fine accession to our collection, a promising clone which will win the hearts of Amaryllis lovers in the future.'' The writer has seen magnificent specimens of this plant to date but too few to form an opinion of the clone for general purposes.

''Pure white,'' in an Amaryllis, is more or less a relative term. All the white *Amaryllis* in the trade have been bred by painstaking segregation and careful crossings out of colored or partly colored *Amaryllis* over the past century. Pure whites were obtained more than 50 years ago, however, in Europe, and are pictured in Dr. Nehrling's monograph ''Die Amaryllis'' (1908).

'White Giant' (Fig. 11) has a light green throat. Grown under glass this green, which exists more or less in all ''pure white'' Amaryllis, becomes a pale or light apple green that is actually charming and sets off the pure crystal snow-color of the tepalsegs. 'White Giant,' however is not always an easy bulb to establish, to grow or to bloom. Unfortunately this is true of most of the whites.

For a specimen of 'White Giant' at optimum quality of flower see the accompanying photograph taken in Winter Park showing a specimen grown in the spring of 1954 by Miss Susan Lupe, an excellent plantswoman. Photo by Sickles Studio. The flower is wide open, flaring, with just about everything an *Amaryllis* could have.

'Queen of the Whites' (Fig. 12) heads the list of the Warmenhoven strain whites. J. R. Manley rated it continuously AA in the Cleveland Amaryllis trials, which he conducted several years ago, and his photographs and color slides show a magnificent specimen which fully deserves the honor. However the writer has found that very few of the bulbs of 'Queen of the Whites' will equal this particular bulb which Mr. Manley received and tested for his trials. Probably 200 bulbs of 'Queen of the Whites' have been bloomed at Lakemont Gardens in Winter Park over the past 10 years, and the quality of the flowers, even on giant bulbs and some well-established, first, second and third year plants, has been good,

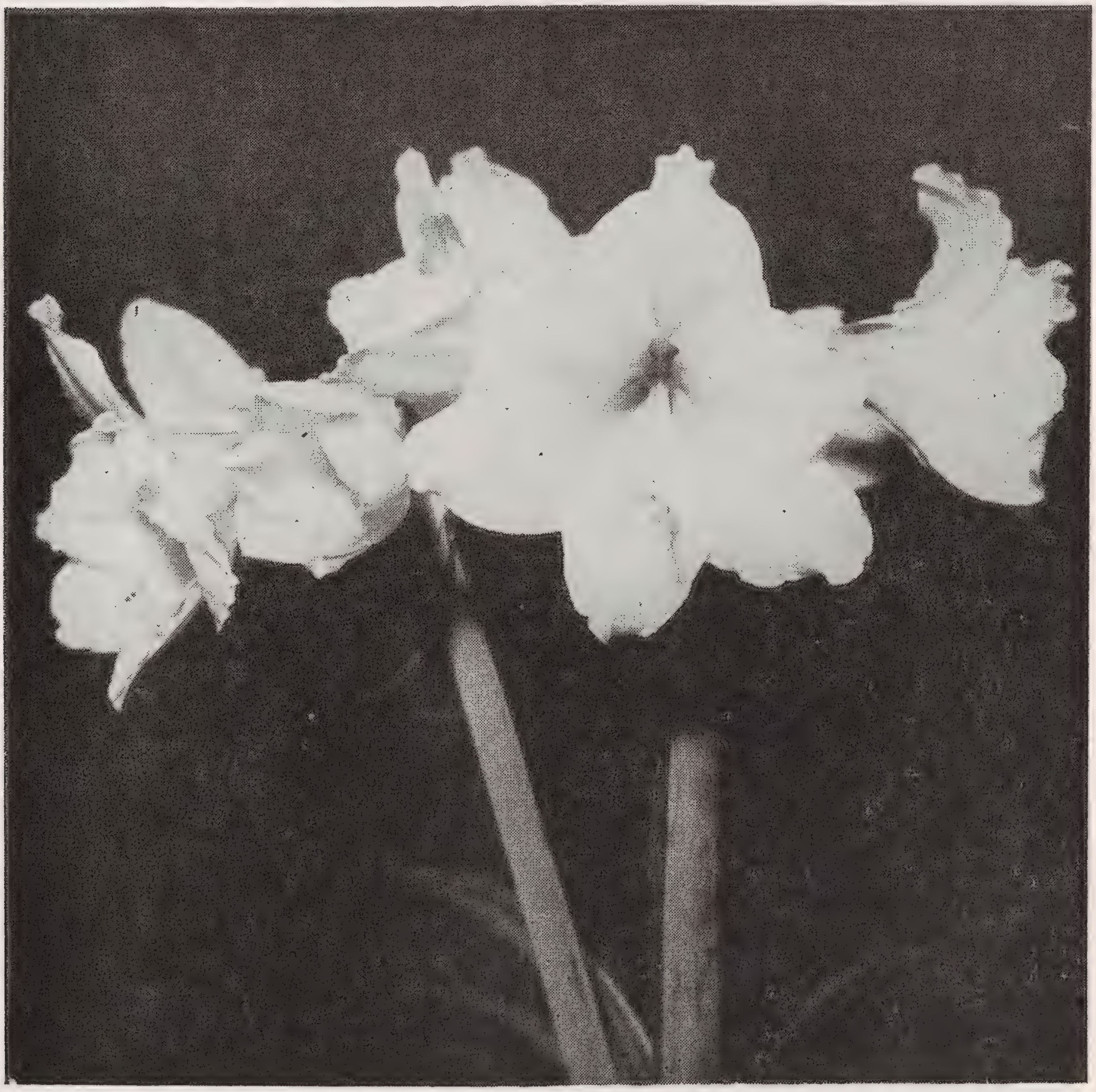

Fig. 11. Pure white hybrid *Amaryllis* clone—'White Giant' (Ludwig), as grown by Miss Susan Lupe, Orlando, Florida, in 1955. Photo—Wyndham Hayward.

bad and indifferent, perhaps one-half good, 10 per cent bad, (definitely rogues) and the balance good to indifferent, but mostly reasonable quality flowers.

The conclusion has been inescapable to persons who have studied these plants in bloom that there are a number of variant types and a few rogues in the 'Queen of the Whites' stock. When one receives one of the top quality bulbs, such as Mr. Manley received, one has obtained one of the finest pure white Amaryllis in the world. It is a huge, rather informal flower at its best, but graceful and charming. Size up to 8 or 10 inches diameter. Narrow petaled types and bulbs producing greenish or red dottings or markings on some petals form the major part of the rogues. About two out of fifty bulbs each season turn out to be some other color entirely, definitely showing the presence of rogue material.

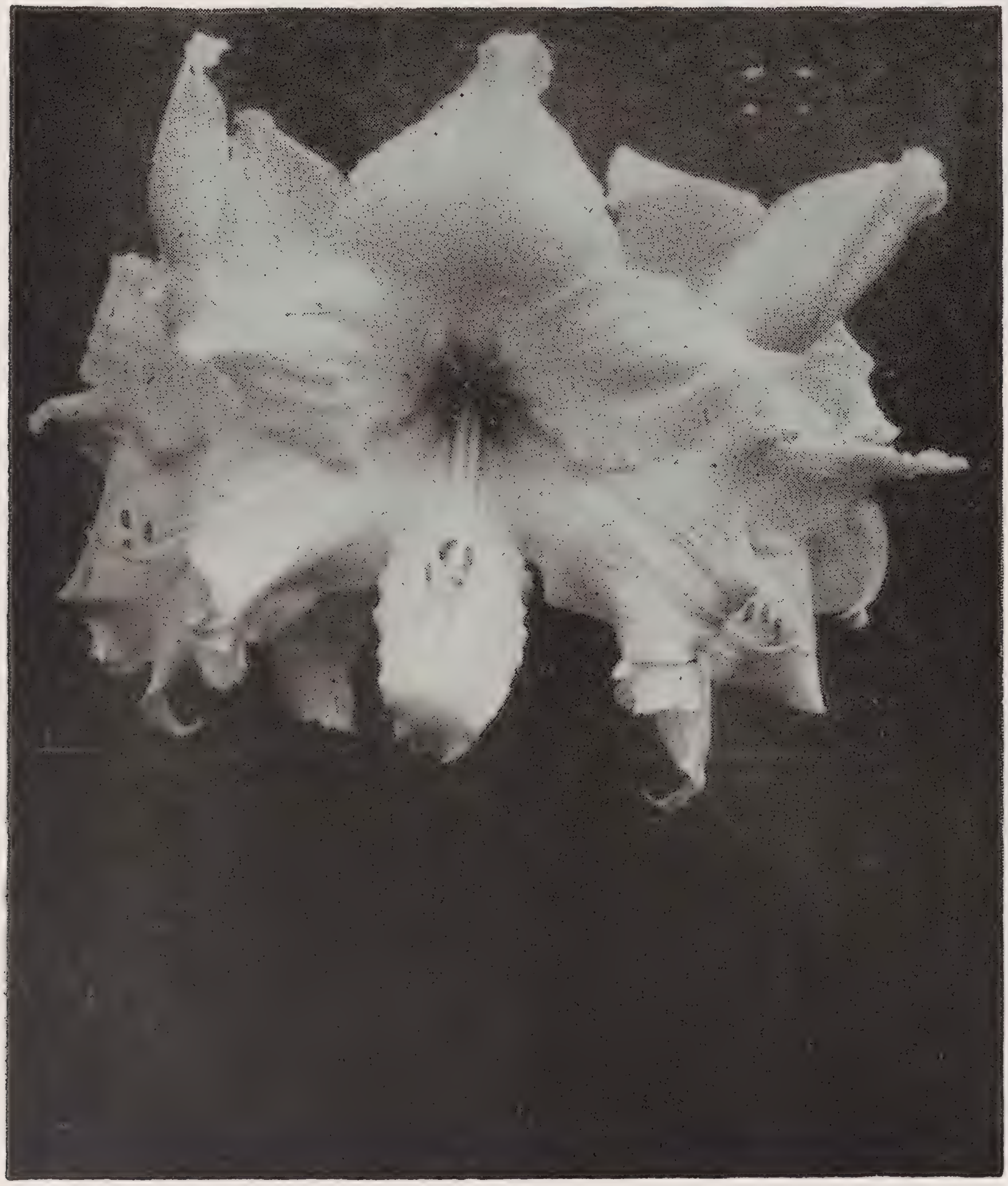

Fig. 12. Pure white hybrid *Amaryllis* clone—'Queen of the Whites' (Warmenhoven). Photo—Thomas R. Manley.

This is easily understood when one realizes the difficulties and scientific control necessary for the vegetative production of a true stock of a pure white named clone of Amaryllis. It is only too easy to spill a few of the small vegetative propagations by accident from one flat to another in the lath house or greenhouse when the cuttings are being

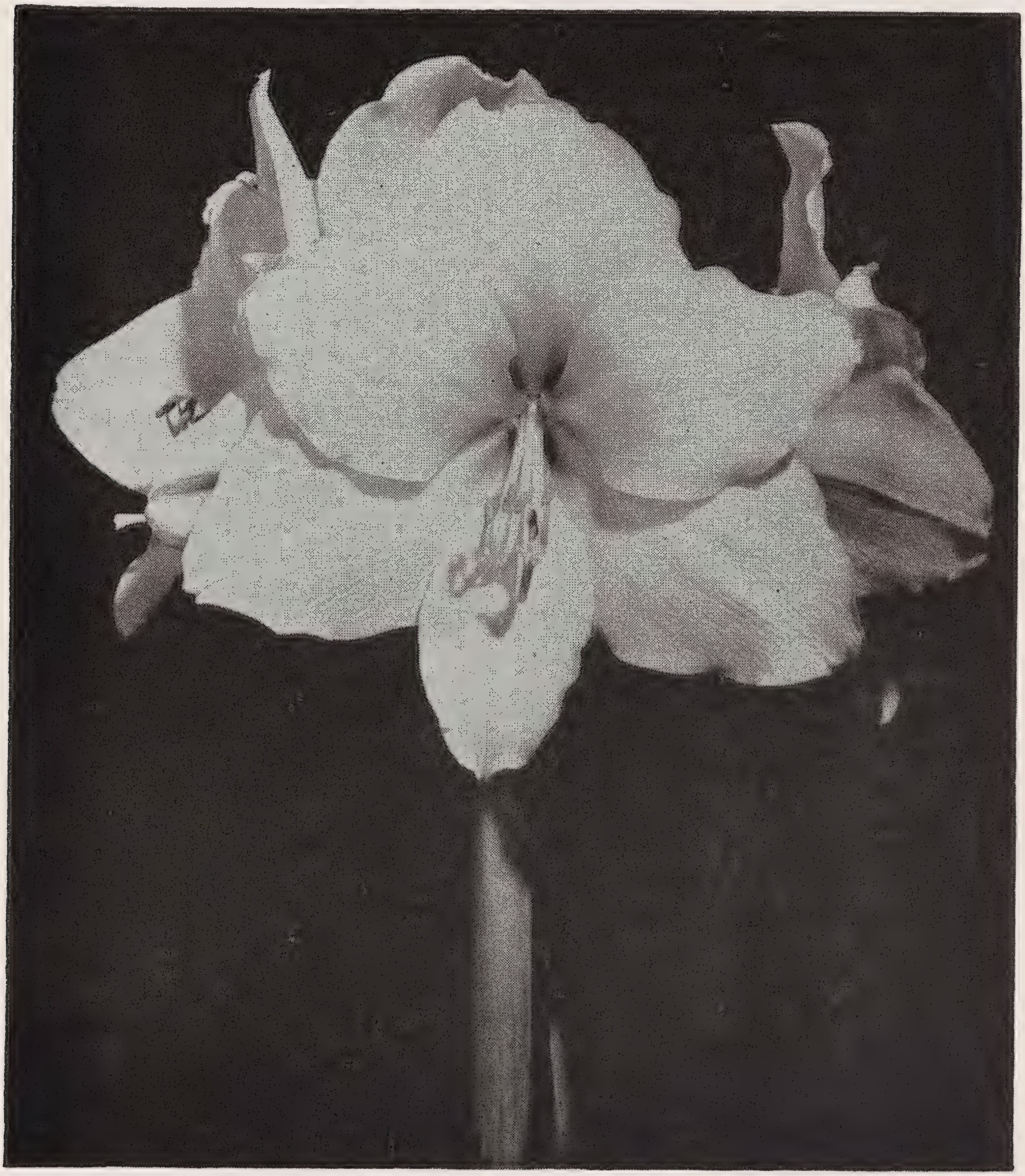

Fig. 13. Pure white hybrid *Amaryllis* clone—'Nivalis' (Ludwig). Photo—Shockley.

made by hundreds and inserted in the propagation flats. The stock could be cleaned up by propagating only from bulbs of known superiority, the best types in the clone.

However, here another factor enters the picture. John Weisner and others who are experimenting with the Dutch propagation cuttage methods report their sincere belief that newly propagated bulbs may show variation the first season or two after they mature. In other words juvenile bulbs may not, even under optimum culture, reveal the full glory of the mature parent clone. This could indicate that some of the ''good to inferior'' bulbs which have turned up in 'Queen of the Whites' and other clones are merely the product of juvenile bulbs, not yet old enough to produce top quality flowers.

One factor which may influence this is that a normally grown adult Amaryllis bulb is three to four years old when sold, at mature size of 3 to 3½ inches diameter (26-28 cm.). However, by rushing the bulbs in growth, forcing them into a quick maturity, with heavy over-fertilizing, one can produce Amaryllis bulbs 2½ inches diameter and up, which are blooming size, in 18 months to 30 months. It is possible that these heavily forced bulbs will not produce a top quality flower the first season. This is worth investigation.

In other words an Amaryllis bulb started in October of 1950 from small vegetatively propagated cutting, could have been ''forced'' to blooming size in the case of a reasonably vigorous clone, by March 1952 (18 months), and readily by March of 1953 (30 months). But the commercial grower who takes the normal three or four years, will not have had the bulb attain blooming size until 1954, or possibly 1955 in the case of a slow growing clone. All the pure white Amaryllis are slower than most of the colored clones in their growth, more delicate in constitution, and generally less vigorous and thrifty, as is the case with other pure white flowers.

Other good pure white clones in the Ludwig portfolio are 'Snow Queen' and 'Nivalis' (Fig. 13), excellent quality bulbs, with medium size flowers, easy for the amateur to grow and bloom and free flowering under good culture. These will last for years in a collection with proper care. They are not recommended for outdoor culture, although some fanciers do succeed with them outside in the lower South. They come from a long line of greenhouse generations, are less robust than their colored confreres, and need more protection from torrential rains, cold and hot sun in the lower South and similar climates. In the North they are strictly a pot plant.

Other Ludwig pure whites include 'Bridesmaid', 'Early White' (the earliest flowering of all, but frequently comes with only two flowers to the scape and may show darker shading on reverse of the petals) 'Caspar Ludwig,' etc. These are good, reasonable whites of no special merit over the others. A new Ludwig white named 'Marie Goretti' has interesting fringed character.

Warmenhoven's list of pure whites also boasts 'Joan of Arc,' at its best the world's finest pure white Amaryllis in this grower's opinion, but again, there are occasional rogues and inferior quality flowers. It is wide petaled, just slightly informal (off the stiff, formal pansy shape) enough to make it appealing and lovely. Only about half the bulbs of 'Joan of Arc' which have bloomed at Lakemont Gardens have approached this superb quality flower. The quality runs high in this clone however, and the clone seems reasonably clean and free from aberrant forms and rogues, comparable to the Ludwig & Co. pure white clones in this regard.

Many amateurs who have bloomed no other pure white clone in top exhibition form have had good success with 'Joan of Arc,' hence its popularity in the trade today. Other Warmenhoven whites are 'Mt. Tacoma,' and 'Leading Lady,' which are clones similar to 'Joan of Arc' and 'Queen of the Whites' but which usually do not create so favorable an impression when in flower. With optimum results, however they will surpass an ordinary 'Queen of the Whites' or 'Joan of Arc' in exhibition flower quality.

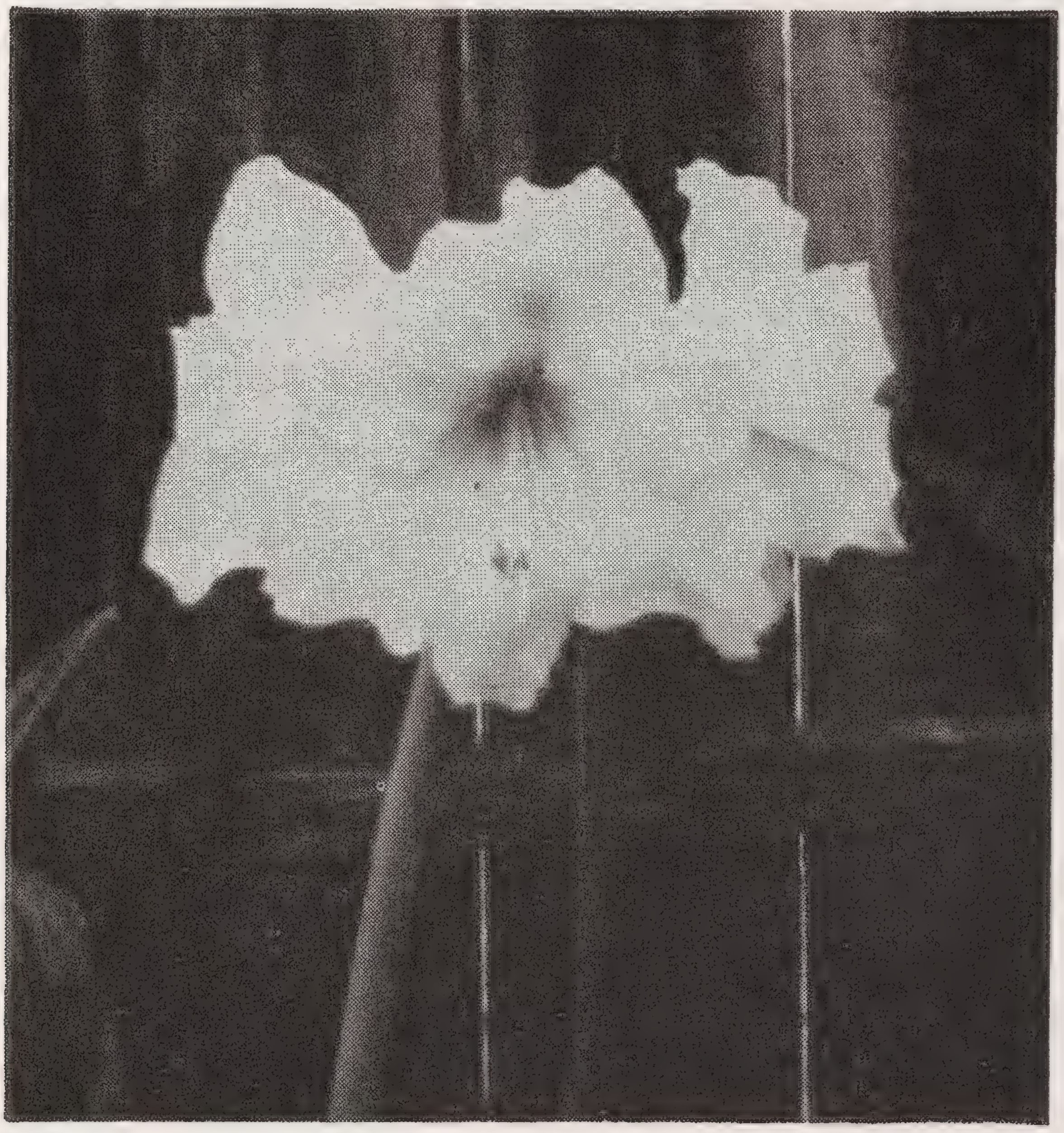

Fig. 14. Pure white hybrid *Amaryllis* clone—'Albino' (van Meeuwen). Photo—Wyndham Hayward.

The only pure white in the Van Meeuwen price list of named clones is 'Albino' (Fig. 14) which has proved to be outstanding in optimum flower form, but occasionally showing variation in the flower and sometimes pink or red dotting on the petals with occasional bulbs, as do the Warmenhoven clones, especially during warm weather in spring at the height of the blooming period. The Ludwig bulbs seem nearer the pure albino type, and seldom or never show the red dotting or lines. These traces of color ancestry occur mostly on petals of second or third or fourth flowers to open in the case of 'Queen of the Whites' or 'Albino', and are no serious detraction.

SUCCESS WITH **ZEPHYRANTHES FLAMMEA**

MRS. MORRIS CLINT, *Texas*

Toward the end of December, 1953, about 30 bulbs of *Zephyranthes flammea* (R. & P.) Baker were received from Dr. Cesar Vargas of Cuzco, Peru as "*Zephyranthes tubiflora* var. *flammea,* coastal type collected near Cuzco." When asked about culture, Dr. Vargas stated that the bulbs grew in sandy clay soil in full sun and bloomed in the month of September, the beginning of spring in Peru. Information from other sources of this species in the wild told of climatic conditions impossible to duplicate in our garden. However, our experience with various Mexican species of *Zephyranthes* has shown us that natural environmental conditions usually must be somewhat or even radically altered for successful garden culture, so it was decided to forget all that we had read about the habitat of this species and to use the meager information received from Dr. Vargas as a starting point and feel our way from there.

With the bulbs came 15 tiny, hard-coated, seed like bulblets, 1/8″ to 1/4″ in diameter. We now know that these are the mature bulblets often found around the base of some species in the subgenus *Pyrolirion,* but at the time we were quite mystified as to their identity. Of course, natural curiosity prompted us to plant them. Not certain whether they were seeds or bulbs, we set them about 1/2″ deep in a 6″ bulb pan in ordinary potting soil and kept them moderately damp. Within a few weeks we were rewarded with a few tiny, thread-like leaves. When the contents of the pot was transferred to open ground around the last week in February, more than half of the bulblets had sprouted and shortly after most of the others came up (eventually, 14 were raised to maturity). All grew so rapidly that their marked resemblance to the older bulbs soon left little doubt as to their true identity.

The adult bulbs were first planted in three 7″ bulb pans in sandy loam potting soil, with oak leaf mold added for humus content. The pots were kept in as much sun as our patio could provide and watered rather sparingly. Leaf growth was slow and reluctant, but satisfactory enough. Late in February, 1954, the bulbs were planted in our amaryllid beds at the farm in three different locations, with the light varying from full sun to more than half shade. The bulbs in shade stayed moist longer and soon outgrew their sisters in full sun. Light rains in April and May, however, reversed the picture and, in addition, the group in full sun rewarded us in May with a gorgeous, flame-red blossom (Fig. 15). During this entire period, natural rainfall was very light and infrequent and auxiliary watering was resorted to only when the plants showed serious need, for fear of rotting the bulbs. On June 24, a small gulf hurricane brought us 4″ of rain. The response of all bulbs to the extra moisture was so immediate and so startling that we resolved to increase our watering program in the future—at least during their active period of growth.

When the heavy rainfall brought no more flowers, we wondered whether the bulbs would bloom in September or whether they would adapt themselves to our seasons and bloom normally during our own spring. In September, 1954, the rains were late, but a series of showers ending in very heavy rainfall around the first week in October brought no blossoms on our bulbs, so the first of the questions was answered. Shortly afterwards, the bulbs began to go dormant so it was decided to proceed on the theory that they would bloom in the spring if allowed a

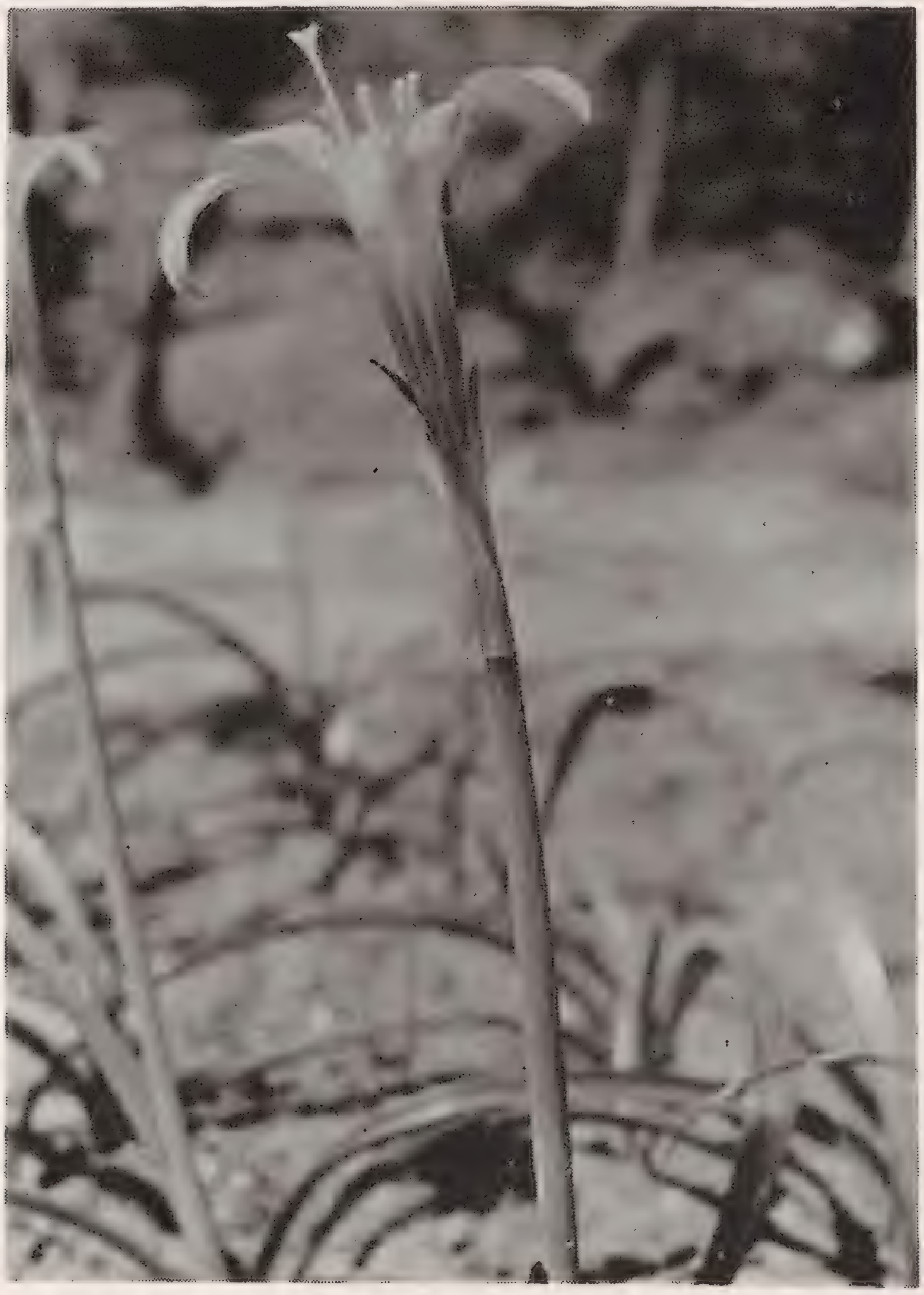

Fig. 15. *Zephyranthes flammea* from Peru, as grown by Mrs. Morris Clint at Brownsville, Tex. Scape 11-½ inches tall; flower 3½ inches in diameter. Photo—Mrs. Morris Clint.

period of winter rest. Consequently, when we were forced to move the bulbs (late in October) in re-vamping some of the beds, we replanted them immediately without watering them.

All but the clump of bulblets were dug and found to be large and solidly healthy. Most of the bulblets on the first clump that we handled were unfortunately lost, for we were unaware that the small bulblets detach themselves and inch away from the mother bulb when mature. They are easily lost in the loose soil and extreme care is necessary to gather the entire supply. We now find it simpler to locate and remove them before disturbing the older bulb in any way. This is not too difficult, as we found that the largest bulbs were very shallowly seated in the ground, with only an inch of soil above the tops of the bulbs.

For our new location, we chose a newly prepared bed of sandy loam on a slight slope, partially shaded in the summer after 4 P. M. by an ebony tree. The soil had been spaded to a depth of 10″, mixed with gypsum (to help dissolve a salt crust which forms when strong gulf winds bring salt laden air and dust across miles of prairie and farm lands to the north and east) and superphosphate, and about an inch of granulated peat thoroughly mixed with the top 4″ of soil. The bulblets were planted about ¾″ deep in separate rows in the same bed. At the present writing (July 1, 1955), all or most of these bulblets are still firm and good, but have just begun to sprout. We now regret that we had not planted them in pots and kept them moist, as we would have gained 6 months or more in time.

The bulbs were not watered at all during the winter and early spring and rainfall for the same period was negligible. Early in April, we noticed the first tips of green showing on a few of the Peruvian bulbs, so decided that the time had arrived for their first watering. Light rain fell that night and one can imagine our joy and satisfaction when we discovered 3 buds the next morning. The beautiful flowers stayed in good condition for 3 or 4 days, were hand pollinated, but failed to set seed. A heavier watering was given about 10-14 days later—which brought 10 flowers, including one on the group of young bulbs we had raised from bulblets! On the next blooming, we had 15 flowers, including several on the young bulbs, and by the end of May, all of the larger bulbs had bloomed and most of the bulblets. Whether we may expect more than one blossom per bulb when they are more established remains a question still to be answered.

All efforts to set seed have so far failed, but the quantity of bulblets produced by each bulb and the short time required to bring these along to blooming size should satisfy all amateur propagation problems. Our young bulbs were moved for the first time around the first of May, 1955 and were found to possess both mature and newly forming bulblets. The latter were planted immediately in pots and have already started to sprout, so we are well under way with our third generation.

As we have now carried the Peruvian bulbs well past a full year's cycle of growth, and have grown and flowered one set of bulblets, it seems safe to believe that *Zephyranthes flammea* and possibly other relatives of this species can be grown and flowered successfully in the Rio Grande Valley of Texas and in other regions having similar climatic and soil conditions.

HAEMANTHUS ZAMBESIACUS

L. S. Hannibal, *California*

This rather unknown plant is allied to *Haemanthus multiflora* in that it has a leafy stem sheathing the leaves, keeping them well clear of the ground, and a scape that is quite sturdy, which supports a colorful flower umbel. *H. zambesiacus* Baker is found in the summer rainfall area of Southern Rhodesia at an elevation of 5000 feet. Typical of the plants of that area it is spring flowering (November) with the foliage appearing soon after the scape has reached its full development. From descriptions the plants must provide a vivid splash of color across the veld when in flower. This is understandable as the entire umbel with its many flowers is a very brilliant red.

On close examination the umbel is composed of a hundred or more individual flowers, each on a delicate pedicel 2 or 3 cm. long and less than a mm. in diameter. The tepalsegs have degenerated to a point where they are merely fine filaments about 15 to 20 mm. long. The floral pigmentation, a deep red color is carried in both these tepalsegs and the stamens. The anthers are quite small, but a bright yellow, and show up quite vividly when examined closely. The spathe valve is in five parts.

The writer's bulbs were received too recently to know much about their culture. Apparently they grow in a black loam (an equivalent of our ''Black Adobe'') and should be hardy to relatively sharp dry winter conditions. From the appearance of the initial blossom the plant is a welcome collector's item.

NEW HEMEROCALLIS INTRODUCTIONS OF MERIT

Philip G. Corliss, M.D.
Somerton, Arizona

The increasing number of hemerocallis registrations and the swelling ranks of breeders make it impossible for any evaluator to be familiar with the merits of all the new varieties. There are doubtless many fine daylilies now available which are not included in the following recommendations because I have been unable to study them sufficiently or perhaps even to see them at all during the past season which carried me nearly twenty thousand miles on trips to visit breeders, growers, and exhibitions in all parts of the country. Some omissions are purposeful, however, as the varieties had some fault such as weak scapes, etc.

Personal preferences in flower colors, sizes, patterns, forms, and other characteristics vary. Were it not so, our hierarchy of iris judges would have caused the disappearance of any iris which showed venation at the haft regardless of whether such markings accented or enhanced the beauty of the flower. Some rosarians would have stopped the progagation of all but fragrant roses, despite the offense of fragrance in the hospital or the home and garden of those subject to allergies. There are daylily judges who want flowers whose color is a clear self. Others like only green throats, feeling that green-throated flowers are cool and restful in the midsummer garden when the daylily becomes truly the perennial supreme. (Personally, I would prefer the brightest of throats, as I seek stimulation from flowers—if I wanted to be rested and cooled I would leave the garden for some air-conditioned retreat where I could close my eyes.) Realizing that there are many tastes, I have therefore listed what I found to be the best of many types among recent introductions.

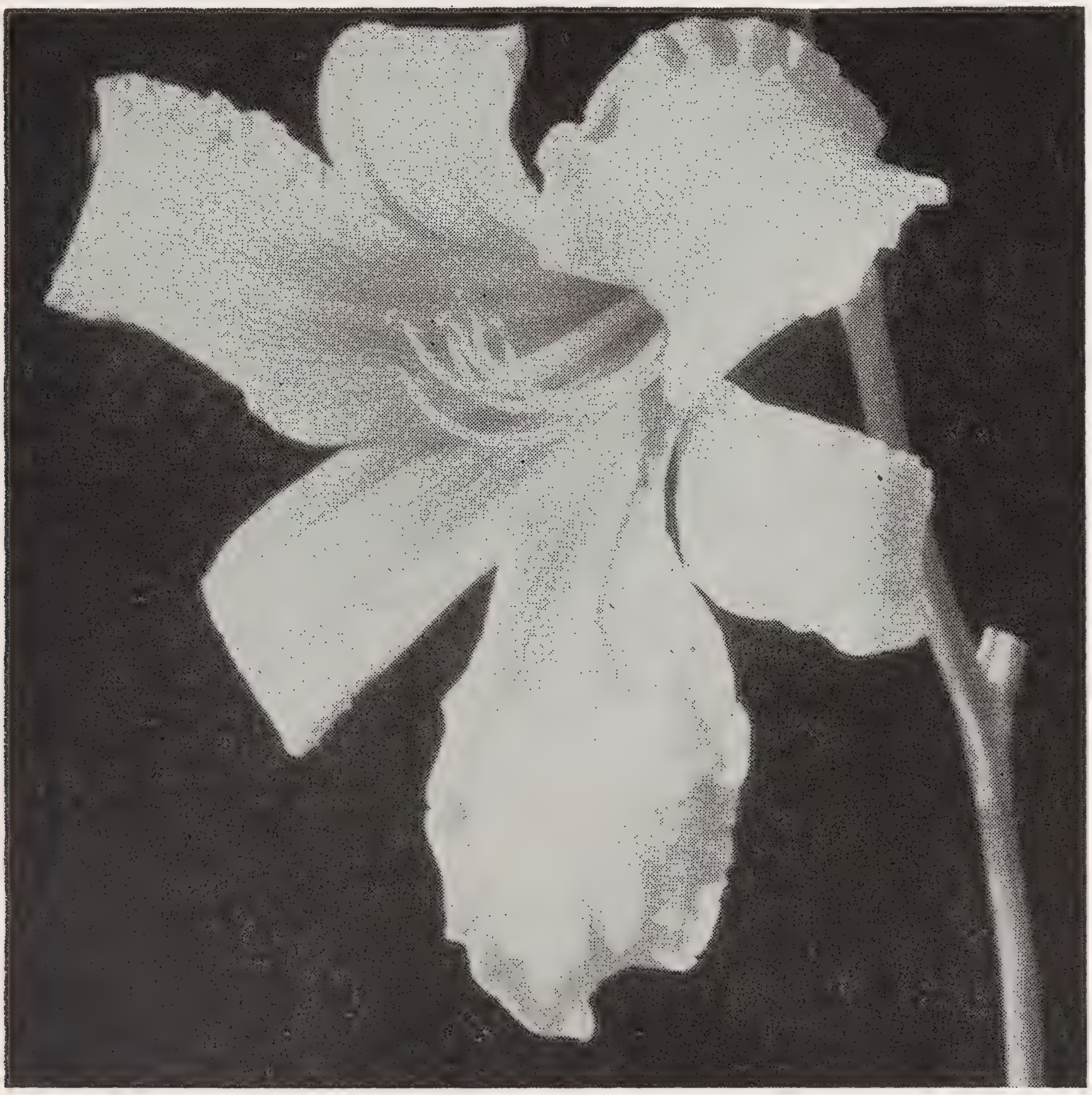

Fig. 16. Hybrid *Hemerocallis* clone—'Green Envy' (Lenington). Photo—Dr. Philip G Corliss.

My article on regional daylily performance appearing elsewhere in this issue should be studied before deciding which of the recommended varieties you will acquire. *The hybrid daylily introduction of 1956 which performs well in every region is the exception.* Introductions from breeders of your region, or from breeders whose past releases have proved to be good in your region, should be preferred.

DWARF: There are but few true dwarf daylilies (under twelve inches in height), the available ones are sparse bloomers and do not have tiny flowers, as do the dwarf roses, etc. Mrs. Robert Schlumpf, of Houston is one of the leading breeders of dwarfs and her 'Yellow Rain' will soon be joined by several others. Among her seedlings are some dwarf doubles. 'Little Cherub' (Claar) will usually fit the height requirement of the dwarf class.

LOW GROWERS suitable for borders were well represented in introductions of the past decades but the interest in larger flowers of more height has caused many of them to fall into undeserved obscurity. Among the newcomers may be mentioned: 'Sparkle' (Arthur Jones, Atlanta) is a dependable bicolor of clean tones and sun resistance—I am proud to have selected it in this breeder's seedling beds. 'Dixie Pixie' (Mrs. Will Land, Beaumont, Texas) is a pert little fellow of smart red with an interesting form. 'National Velvet' (Viola Richards, Indiana) is highly acclaimed as a red border flower of good habits. 'Havana Brown' (Milliken) is one of my favorites, although the color has proved to be darker than the name suggests.

SPIDERS: The low favor in which the large spider types was held has been replaced by a general tolerance and even some degree of popularity, especially since they are appearing in clones whose scapes are strong enough to stand erect with their heavy flower load. Even such conservative breeders as Mrs. Thomas Nesmith now introduces some spiders. Among the best new ones: 'Daddy Long Legs' (Mrs. Walter Schroer, Valdosta, Ga.) This was the sensational seedling at the 1954 meeting of The American Hemerocallis Society—a huge yellow spider with stunning maroon band. 'Oliver Twist' (Emigholz): I had the honor of naming this, and am pleased to see that no less an astute judge than Mrs. Frances Lamb of Lexington, Ky., concurs in my judgment. 'Red Resplendence' (Nesmith): This may be considered an huge star-shaped flower rather than a spider, but its brilliant red segments of great length will place it high on any list. 'Sumatra' (Land): This one is different: it has an oriental overlay that gives it charm and distinction. 'Summer Orchid' (Mrs. Aldina Gates, Baton Rouge): The incredible competitive entry of this spider in The American Home Achievement Medal Class at the Baton Rouge 1955 Exhibition gave the judges (I was one) an easy job, although there were thirty-seven outstanding entries in the class. One of the three spikes of 'Summer Orchid' entered held five huge magnificent flowers open; the other two spikes had three flowers each! 'Preacher Gray' (Mrs. Dave Clark, Baton Rouge): This and 'Scorpio' (Wheeler) are the only spiders I have seen whose extensive petals will produce THREE complete twists!

EVENING BLOOMERS: To meet my favor, an evening-blooming daylily should open its flowers as soon as the day's heat is done: at sundown. The evening bloomer that opens at nine or ten is of little merit compared to that which unfurls a fresh flower at dusk when, deprived of the pleasure of our garden by the midday heat, we seek its cool beauty. Evening bloomers should either drop before morning garden visitors appear or should remain in attractive condition until the heat empties the garden of its human elements. The flower which best meets these requirements is 'Twilight Tryst' (Nesmith). Its erect scapes, with high but multiple branching, carry many buds which open yellow flowers with narrow bands. Two other recent Nesmith introductions, 'Thistledown' and 'Eventide' also receive high rating. For those who prefer evergreen varieties, 'Night Life' (Register) is supreme.

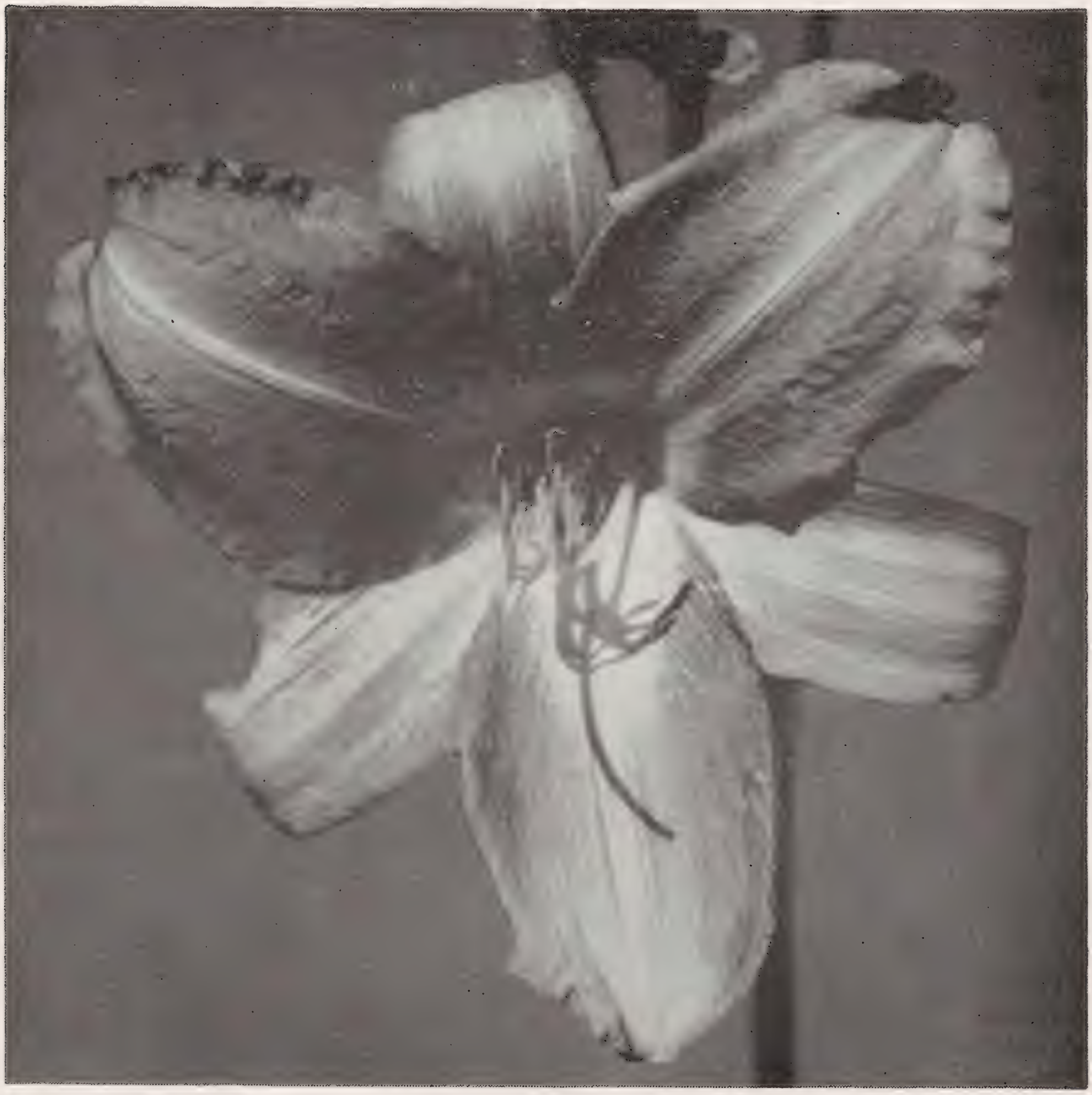

Fig. 17. Hybrid *Hemerocallis* clone—'Sunset Sky' (Bright Taylor). Photo—Dr. Philip G. Corliss.

EYED (BANDED) VARIETIES: This class has indeed received a "new look" during the past few years. Formerly composed chiefly of yellow flowers with dark zones of varying width, we now find in this group large size, triangular form, twisted segments, and a full range of colors. 'Hidden Heart' (Nesmith) for instance, is a pastel lavender with purple band, while 'Hopi Chief' (Connell) has a basic color like the flesh of ripest cantaloupe with purple zone. From Mrs. Bright

Taylor, Mr. David Hall, and the author of this article—and presumably many breeders—we will soon have pinks of various hues with contrasting bands. Among the outstanding novelties are: 'Halo Light' (Nesmith): A 1956 introduction of unusual beauty. 'Nashville' (Claar) The banded wonder that ''has everything''—crimped, twisted segments; large size; triangular form; etc. 'Norma Borland' (B. Taylor): Overlapping petals and deep orange color in a large and vigorous flower of round form. 'Petrouchka' (Nesmith): I watched this one from its virgin bloom and was given the honor of naming it. The unusual melon-colored flower has strong white ribs in addition to its dark bands. 'Trophy' (Saxton): Perhaps the most dependable extended bloomer of this class, remaining open until midnight.

UNIQUE COLORS: There are some named clones which stand alone because of their unusual color. Familiar varieties of this class are 'Kanapaha' (Watkins) and 'Spice' (B. Taylor). Some good new ones: 'Fiftieth Anniversary' (Stout): This is a banded variety, but its peculiar base color of tangerine-like tone with wide purple band make it unique. 'Jack Frost' (Lester): The frosty edge on the segments of this large and beautiful yellow flower may be due to fading, but it is always outstanding. 'Hawthorne Rose' (Bach): This handsome flower has an unusual rose color accented by white ribs which is not duplicated by any variety I have seen. 'Orange Ice' (W. Wood): Here is a large flower in tangerine color which is exciting favorable comment everywhere.

The rest of the new introductions I would recommend, subject to their regional performance, will be grouped by color class only:

PALE YELLOW (NEAR-WHITE) An albino daylily has not yet been reported. The closest approach to white flowers is found in the pale yellows, which vary according to conditions of soil, temperature, humidity, and sun. The late Mrs. William Bach of Bloomington, Illinois had a good lead on most other breeders in the search for light flowers. Her charming 'Snowy Egret' was descended from her yellow 'Alice' and the generation beyond 'Snowy Egret' produced 'White Orchid,' 'White Triangle,' 'White Elf,' 'White Tower,' 'Grace Lanore,' and 'Blanche Lafitte.' From the northeast come 'Carved Ivory' (Nesmith) and 'Evalina' (Saxton), both of them exquisite flowers which are trail-blazers in the quest for whites. The fabulous garden of Mr. Hooper Connell in Baton Rouge has been the birthplace of many outstanding near-white flowers, two of the Connell introductions in this class being 'Fortuna' and 'Verilite.'

MELON (CANTALOUPE or HONEY-DEW, that is): The hems in the delicate melon tones make delightful garden subjects, blending especially well with most other garden flowers. The most outstanding flower in this class is Mrs. Nesmith's 'Precious Treasure,' which surprised me by holding its elusive color in gardens where I have seen it in several parts of the country including the deep South. I am partial to Mrs. Bright Taylor's 'Cockade' for its perky form and frequent extra flower segments. Mr. Lemoine Bechtold's 'Distinction' is a large spider-type flower, unique in this color class, as far as I know.

COPPER: The hardy 'Copper Colonel' (Sass) and the evergreen 'Olive Baldwin' (B. Taylor) are now joined by Mrs. Schlumpf's 'Copper Crest' which I have grown for several years. It performs better each year and is rapidly becoming one of my favorite varieties.

PASTEL: The modest descriptions with which Mr. Henry Sass introduces his hemerocallis have caused many to overlook his delectable 'Ivory Glow,' which is truly a garden treasure. Mrs. Will Land's 'June Ohmstede' is a dependable performer in the class which produced the current Stout Medal winner—'Prima Donna' (B. Taylor).

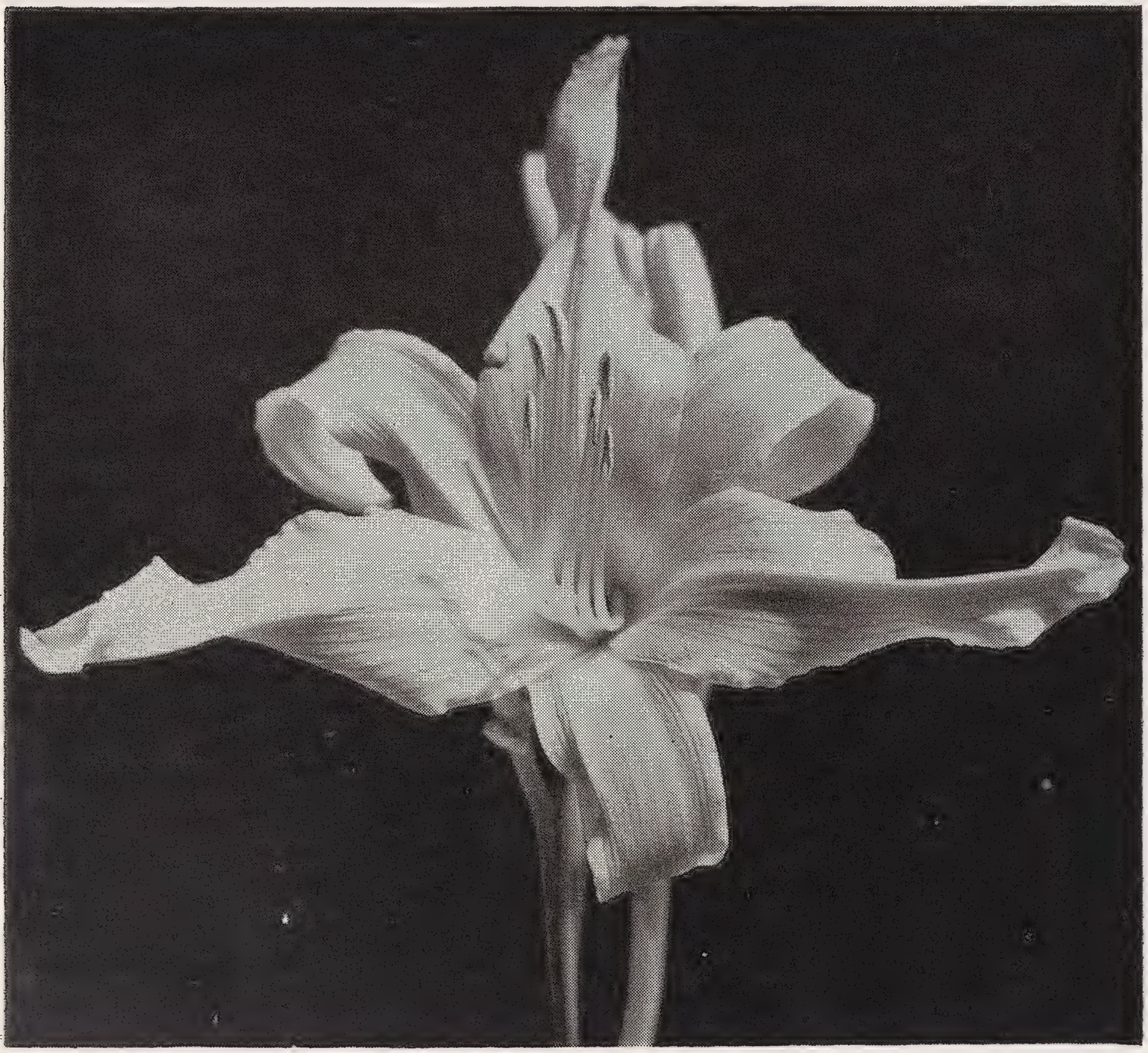

Fig. 18. Hybrid *Hemerocallis* clone—'Beau Brummel' (Nesmith). Photo—Dr. Philip G. Corliss.

FULVOUS: Although it is now the fashion to decry fulvous daylillies, no garden should be without the valiant 'Rusticus' of Mr. Hooper Connell. Its sturdy stalks should serve as models for every breeder who seeks to produce flowers whose scapes will not sprawl into neighboring clumps. The flowers of 'Rusticus' approach a medium brown tone, so heavy is the overlay of brown stippling.

SALMON: Depending on their performance in your region, I recommend either 'Salmon King' (G. Douglas) or 'Salmon Sheen' (B. Taylor).

YELLOW: Despite the great increase of daylily registrations in the past decade, have you ever considered how really few of the yellow varieties are top performers in every respect? Substance, sun-resistance, scape quality, or floriforousness are often lacking in older yellow daylilies. I find that my list of improved yellow daylilies comes chiefly from the south. Listed alphabetically and with their chief merits, are: 'April Showers' (LAND): has delightful form, remontance, large size. 'Butterball' (Schlumpf): is good in the North and the South. Its flower is fragrant and has a delightful open form with charming ruffling. 'Crepe Suzette' (Connell): The overlapping petals are so full that the heavy texture and crimping produce an unique flower. 'Gita' (Traub): Darkest of the medium yellow, this dependable flower on erect scapes is always a garden joy. 'Mary Henry' (Traub): No chorus girl is this stately queen who proudly holds her head above lesser stars. 'Peace' (Register): I see no reason to retract my earlier declaration that this is the finest yellow daylily for southern gardens—its smooth beauty befits its name. 'Spring Song' (Register): Large flowers and loose ruffling identify this handsome variety. 'Yellow Cotton': (C. W. Davis, Baton Rouge): This large flower always attracts attention with its stunning color mass.

ORANGE (GOLD): If 'Naranja' (Wheeler) and 'High Noon' (Milliken) are to be displaced as the leaders of this class, the following seem to be most likely to accomplish the feat: 'Coeur De Lion' (Connell): As stalwart as its namesake, and only one of many fine golds from Mr. Connell. 'Cradle Song' (Milliken): Worthy offspring of 'High Noon,' slightly shorter in scape height, but more floriforous. 'Gold Cloud' (H. Sass): When the modest Henry says, "This is perhaps my finest introduction" you don't need to see it to know how good it is: Terrific! 'Gold Strike' (Milliken): Oh, for a 'Gold Strike' that would never stop blooming! Sutter never had it so good! 'Gold Vellum' (Nesmith): A 1956 entry from Fairmount Gardens that has the chic tailoring one expects from Mrs. Nesmith. 'Golden Cockerel' (Nesmith): Another Fairmount hem I was privileged to name. It is a late-season bloomer that will make friends and influence people in any garden. 'Golden Triangle' (Traub): Will take all comers in its class. 'Louisiana Purchase' (Miss Edna Spalding, Louisiana): A slight fulvous zone fails to dim the lustre of this large and handsome flower. 'Yellow Orchid' (Bach): Don't let the name dissuade you—it is partly my fault, for I simply had to burst into print about this stunner—it is golden.

GREEN: Fortunately (?) there aren't any green daylilies—yet. But the growing number of hemerocallisarians who want to be "cooled" by green throats will be thrilled by Mr. George Lenington's gold 'Green Envy' (Fig. 16) which surrounds a surprisingly large throat of green with full crimped petals of rich gold.

BLENDS: In pastel tones, but with richer coloring than the "pastels" listed above, we suggest these: 'Creole Belle' (Mrs. J. C.

Murphy, La.) Handsome flower with blue tones. 'Chloe's Child' (Nesmith): This large and full flower of open countenance is surely one of Mrs. Nesmith's greatest breeding triumphs. 'Intermezzo' (Wm. Munson, Jr., Florida): Exquisite beauty of form and coloring are combined in an exotic beauty from one of our newest and youngest breeders of distinction. 'Rising Star' (B. Taylor): The advent of blue tones in this leading breeder's introductions. 'San Francisco' (B. Taylor): The availability of this majestic beauty has gladdened the hearts of many who have admired it or heard rumors that it rivalled the charm of its namesake city. 'Sunset Sky' (B. Taylor) (Fig. 17): A true blend, with definite blue cast in the stunning color ensemble.

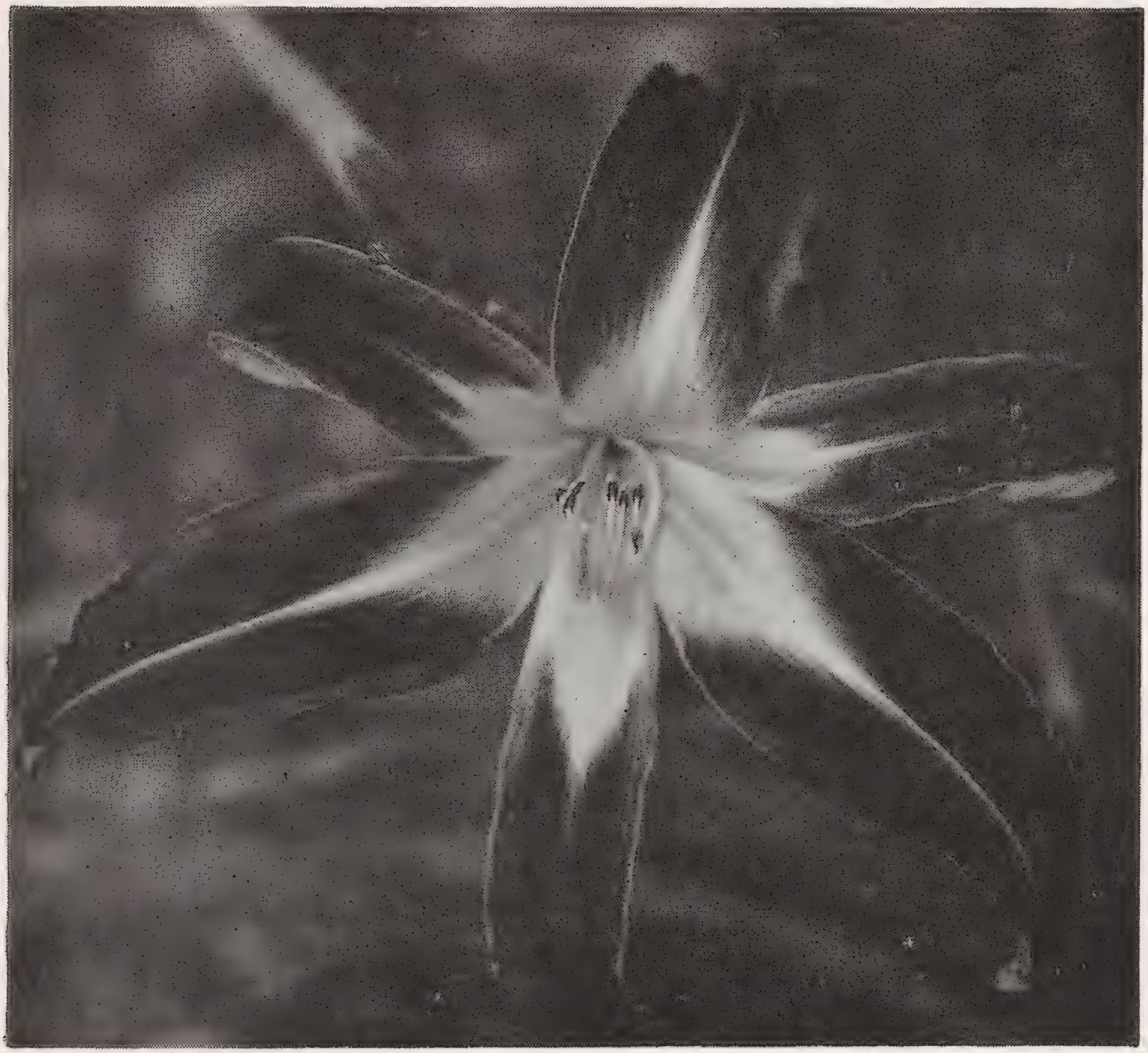

Fig. 19. Hybrid *Hemerocallis* clone—'Marse Connell'. Photo—Dr. Philip G. Corliss.

BICOLORS: This class should be limited to those flowers whose sepals and petals are contrasting (not banded varieties) and a separate class should be provided for bitones (sepals and petals of varying depths of the same color). The best new ones: 'Gay Lark' (Connell): This one has already climbed high on the Popularity Poll and needs no "push" from anyone. 'Merriewoode Star' (W. Wood): This enormous flower of tawny brown and yellow will please especially those male gardeners who like their hems to be big and spectacular. 'Son of Troubadour' (C. W. Davis): Worthy son of a worthy parent! Now we will tackle the large class of shades of red—from pink to darkest black-red. Regional performance and local conditions will affect the color of these flowers more than those in the yellow classes.

PINK: Please remember that there are many "pinks" in all color charts. A salmon-pink is a pink according to the charts just as truly as that baby-ribbon pink which most people expect when you mention "pink". The most outstanding baby-ribbon pink is still 'Marie Wood' (W. Wood) but it is a capricious performer in many climates. When it thrives, it has no close rival in its color class. Of similar color, and a good performer, is 'Pretty Pet' (Nesmith). Although Mrs. Nesmith's Pink Prelude is still new and scarce enough to include in this list, I must confess to a preference for some of its direct descendants—notably 'Pink Profusion' and 'Her Majesty.' Stevens' Pink Damask is another northerner of which the same things may be said as of 'Pink Prelude.' From the Chicago breeders, 'Evelyn Claar' (Kraus) continues to rate highly and its offspring, such as 'Tootie' (Claar) carry its orchid tones. We have some fine "frosty" pinks now available. These are pinks which, when they fade, attain a delectable frosty sheen like strawberry meringue. Viola Richards' 'Cherubim' and 'Seraphim' appear to be two of the best of this type. We still like Frank Child's 'Pink Dream,' but, like 'Pink Prelude' and 'Pink Damask,' some of its offspring seem superior. 'Pink Delight' and 'Pink Paradise,' both from Geddes Douglas, are strong contenders among the pinks. Despite the availability of these fine pinks, regional factors will make it wise for gardeners in the deep south to depend on the pinks developed from Mrs. Bright Taylor's line breeding for best performance.

ROSE: The baby-ribbon pink is really a diluted rose. Under certain conditions, many flowers classed as "pink" may have a depth of color which takes it into the "rose" class, and some classed as "rose" may often bloom as "pink". An outstanding example of such a chimera is Mrs. Hugh Lester's tremendously popular 'Picture,' a beautiful flower under any condition. Also, like her 'Galahad,' Mrs. Lester's 'Picture' flourishes in apparently all regions. Among new rose introductions from the north, 'Rose Brocade' and 'Regency Rose,' both from Mrs. Nesmith, are outstanding. 'Rose Overlay' (G. Douglas) is a luscious beauty. Among the evergreen varieties, I particularly like Mrs. Bright Taylor's 'Celebrity' because of its size, form, and vigor.

SALMON RED: In this class I include the light brilliant reds which incline to the yellow side of the spectrum. The best example of this color class is Mrs. Nesmith's well-known 'Bloodroot', and it is the Nesmith descendants of 'Bloodroot' which still rule the class: 'Pimento,' 'Pirate's Treasure,' and 'Mount Joy' are now joined by 'Beau Brummel' (Fig. 18) which has added the large size, twisted petals, and triangular form to this color class. Among the evergreen varieties I like Mrs. Bright Taylor's 'Rebel Red.'

RED: Here are the spectrum reds, garnets, rubies, and other red beauties. The best new ones: 'Bess Ross' (Claar): This one is drawing raves from such widely separated gardeners as Mrs. Douglas Pattison (Calif.) and Gene Wild (Missouri). 'Betsy B.' (Vestal): This one "did something" to me at the Little Rock meeting, and does it again every year. 'Dark Secret' (Connell): Here is one of the few flowers that can

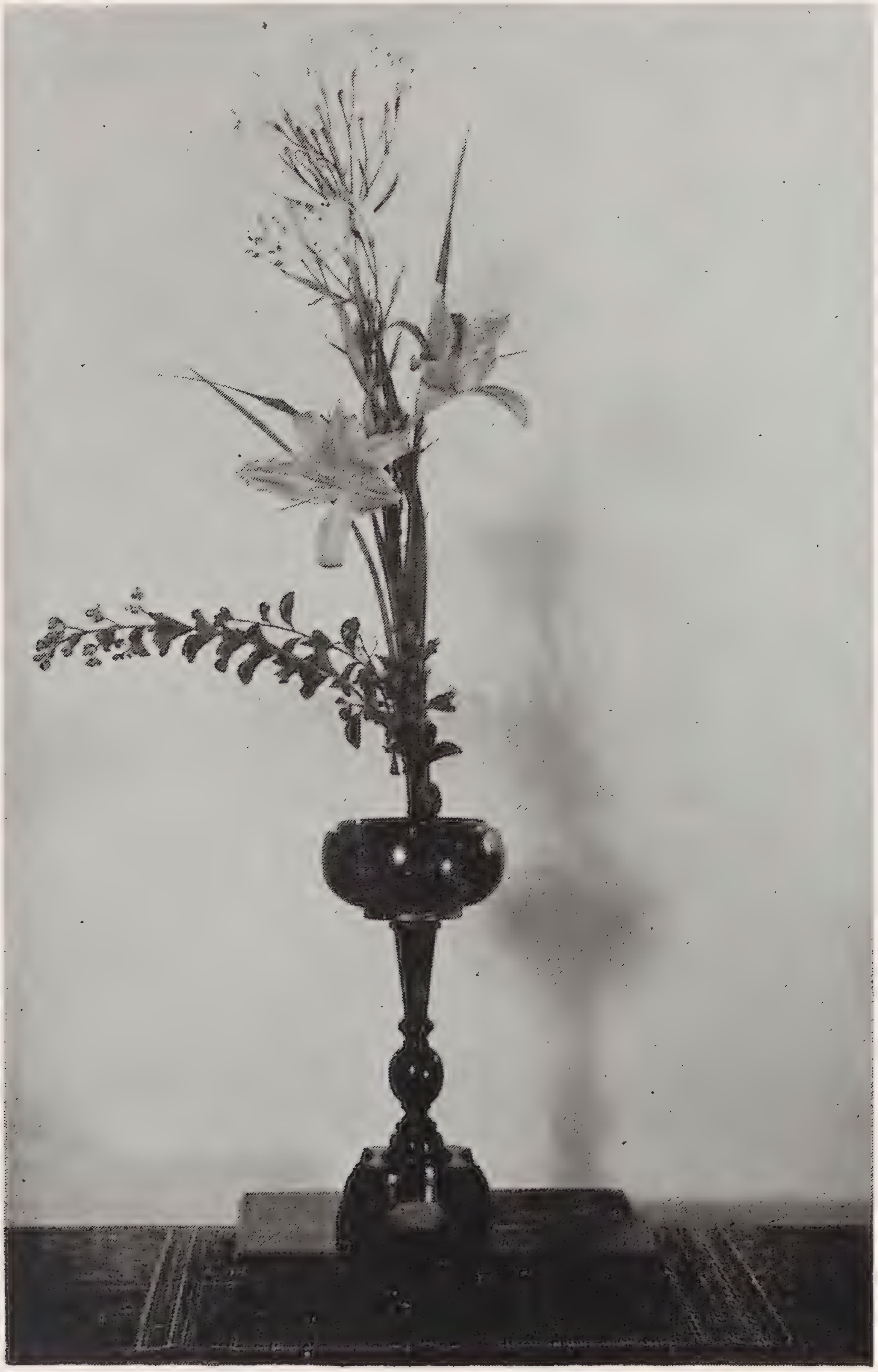
Fig. 20. Daylily flower arrangement including also Alstroemeria and other plant material. Photo—Dr. Philip G. Corliss.

rival the velvet elegance of 'Garnet Robe.' 'Marse Connell' (Connell) (Fig. 19) is the ruby bitone mastadon first escaped from the once-unsuspected nest of so many amazing hybrids to bring fame and its attendant rewards (?) to its quiet and modest originator. 'Crimson Velvet' (Nesmith): is the latest of a distinguished line of ruby beauties which has paraded from Fairmount Gardens ever since 'Royal Ruby' was introduced. 'Semaphore' (Connell): is another solid ruby Connell variety with tremendous color value and velvet texture. 'The Doctor' (Claar): continues to out-perform all other good reds as far as sun-resistance is concerned.

PURPLE: Yes, the dark reds are getting more blue in their make-up. Descendants from 'Amherst' (Wheeler) and 'Canyon Purple' (Nesmith) are the new 'Winter Purple' (Wheeler-Murphy) and Mrs. Nesmith's 'Hidden Heart' and 'Purple Pageant.' From Mr. Connell comes 'Blue Horizon.'

BLACK-RED: Many in this class were formerly called "purple". Good new ones include: 'Convoy' (H. Sass): Dependable, handsome, dark. 'Royal Champ' (H. Sass): A newcomer with height that will set him on guard over lesser fry. I am impressed. 'Royal Envoy' (B. Taylor): The darkest flower to date from Mrs. Taylor, and it has all the good qualities which are expected of her introductions. 'Royal Mantle' (Land): A stunning large flower with recurved segments. 'Royal Toga' (Register): This is still Mrs. Register's finest entry among dark-colored varieties, in my opinion.

BLACK: Not many years ago some of the black-reds were called "black." We now have flowers so dark there is no other place to classify them. Two of our leading newcomers among the breeders seem to have the edge here: 'Black Butterfly' (Mrs. J. W. Alexander, Texas): The Alexander varieties in the L. S. U. test garden at Baton Rouge were one of the outstanding features of the 1955 hem meeting. This variety was one of many in her collection which impressed many visitors. 'Black Knight' (Schlumpf): Here's a really dark one from Houston.

Now, PLEASE, if you got into this article in the middle, go back and read the first three paragraphs and the preceding article. Then you won't be too hard on me if I missed some spectaculars, or if you mortgaged the old home to surround it with some of the varieties I have suggested and they do not reward your favor.

REGISTRATION OF NEW AMARYLLID CLONES

Registrars: Dr. J. B. S. Norton and Prof. W. R. Ballard

This information is published to avoid duplication of names, and to provide a space for recording brief descriptions of new Amaryllid clones. Names should be as short as possible—one word is sufficient. It is suggested that in no case should more than two words be used. *The descriptions must be prepared in the form as shown in the entries below, and must be typewritten and double-spaced.* The descriptive terms used should be in harmony with those given in the "Descriptive Catalog of Hemerocallis Clones, 1893-1948" by Norton, Stuntz and Ballard.

There is close liaison between the AMERICAN PLANT LIFE SOCIETY and the AMERICAN HEMEROCALLIS SOCIETY regarding the registration of new hybrid daylily clones. By cooperative arrangement with the AMERICAN HEMEROCALLIS SOCIETY, beginning with the 1951 HERBERTIA edition, descriptions of only such hybrid *Hemerocallis* clones for which the registration fee has been paid to Registrar, W. E. Monroe, 2244 Cloverdale Ave., Baton Rouge, La., will be included here also, if requested, and space is available. Correspondence regarding new hybrid Hemerocallis clones to be published in HERBERTIA should be addressed to Prof. J. B. S. Norton, 4922 40th Place, Hyattsville, Maryland, *enclosing self-addressed, stamped envelope,* for reply.

Correspondence regarding other amaryllids such as *Amaryllis, Lycoris, Clivia, Crinum, Brunsvigia, Hymenocallis,* and so on, should be addressed to: Mr. W. D. Morton, Jr., Registrar of Amaryllid clones, 3114 State Street Drive, New Orleans 25, Louisiana, with registration fee of $2.00 for each clone to be registered.

HYBRID AMARYLLIS CLONE

Introduced by Ludwig & Co., Hillegom, Holland,—

'LaForest Morton'. Outstandingly beautiful dark pink Leopoldii; scape 28"; 6½" wide across face; uniform dark pink self. *Registration No. A-390.* More detailed description will be included in the 1957 issue. Named in honor of the late Mrs. W. D. Morton, Jr. (LaForest Smith Morton).

HYBRID HEMEROCALLIS CLONES

Introduced by Dr. Philip G. Corliss, Somerton, Arizona.

'Black Gold'. Flowers a black self with nasturtium (RHS-610) throat, diamond dusted, 5½" flower, full, widespread; scape 36", high, multiple, close branching; evergreen; diurnal; recurrent; extra early; sun resistant; scape proliferations. June 7, 1955.

'Cocopah Rose'. Height 48"; early, remontant, evergreen; scape erect, branching high; banded; petsegs and setsegs porcelain rose (RHS 620), throat persimmon orange (RHS 710), with wide eye-zone of plum purple (RHS 934); heavy substance, full, widespread (6").

'John Harvard'. Height 30"; extra early, remontant; bitone, petsegs cardinal red (RHS 822), setsegs orient red (RHS 819), throat nasturtium (RHS 610); extended bloomer, evergreen, flower 5" wide, widespread.

'Golden Pinafore'. Height 30", early midseason, remontant; ruffled gold flower—tepalsegs and throat cadmium orange (RHS 608), evergreen, flower 4½", full, recurved.

'Cocopah Firebrand'. Height 45", early, remontant; tepalsegs blood red (RHS 820) self, throat Chinese yellow (RHS 606), evergreen, sun resistant, flower 5½" wide.

THE GENERA **RHODOPHIALA** PRESL AND **PHYCELLA** LINDL.: KEY TO THE SPECIES AND SYNONYMY

HAMILTON P. TRAUB, *California*

During the year 1955, Miss Josephine Henry set out on a plant collecting trip in South America. She will travel in various countries as far south as Chile, and will collect various plants, including amaryllis. Since only a limited number of the 31 small-flowering species formerly grouped with *Amaryllis* L. (in the tribe *Amarylleae)* are available in the United States, she plans to collect as many of these as possible in Chile. Traub (1952; 1953) has shown on the basis of breeding experiments that most of these species belong to the genus *Rhodophiala* Presl (in the Tribe *Zephyrantheae).* A few have been referred on morphological grounds to *Phycella* Lindl. (in the tribe *Eustephieae).*

When the plants to be collected by Miss Henry arrive, it will be necessary to identify them. For this purpose, a revised key to the species is required. The objective of this article is to fill this need.

A few words are in order about the use of the key and synonymy. Descriptions of all of the species are at present available in Traub & Moldenke's Amaryllidaceae: Tribe Amarylleae (1949). After any particular species has been singled out by means of the key, the reader may look up the description by means of the index in the text just mentioned. In the text the description appears under the generic name *Amaryllis* plus the species epithet which is carried over to *Rhodophiala* in practically all cases. All of this data will appear in the complete text of the *Amaryllidaceae* now in preparation for publication, but a few years will elapse before this will be actually published. In the meantime, the present key and synonymy will serve the immediate need.

GENUS **RHODOPHIALA** PRESL

Bot. Bemerk. 115. 1844 (lectotype—*Rhodophiala amarylloides* Presl, see Taxon, 1: 122. 1952; Plant Life 9: 59. 1953). Syn.—*Rhodolirion* R. A. Phil., in Linnaea 19: 65. 1857-58 (type: *Rhodolirion andinum* R. A. Phil.); genus *Myostemma* Salisb., in Gen. Pl. Fragm. 135. 1866 (type: *Myostemma advena* (Ker-Gawl.) Salisb.).

Diagnosis.—*Chromosomes* as far as determined: $2n = 18$; *bulbous* perennials; leaves narrow-linear, usually 2—5 mm. in width, rarely wider—up to 1.3 mm., or 20 mm. wide; *peduncle* hollow, leafless; *umbel* 1—6-flowered; *spathe* usually of two free valves, rarely monophyllous, or the two valves slightly united at the base; *bracteoles* very small to tiny; *pedicels* variable in length; *ovary* 3-loculed, *ovules* numerous in each locule; *perigone* bilaterally symmetrical, variously colored, openly funnel-shaped, funnel-shaped, or sometimes not widely open, or the tepalsegs even formed into a pseudo-tube above the tepaltube; *tepaltube* usually very short, under 5 mm. long, rarely up to 5—7.6 mm., or 13—20 mm. long; *tepalsegs* 6, of four different sizes, usually longer than the tepaltube; *stamens* 6, of four different lengths, stamens and *style* fascisculate, declinate-ascending; *anthers* oblong, versatile; *stigma* distinctly trifid or obscurely trifid (capitate); *fruit* a loculicidally dehiscing capsule; *seeds* discoid, winged, dark brown or black.

TYPE SPECIES: *Rhodophiala amarylloides* Presl, Bot. Bemerk. 115. 1844 (= *Rhodophiala pratensis* (Poepp.) Traub.

PHYLOGENETIC POSITION: *Amaryllidaceae,* Tribe *Zephyrantheae,* near Habranthus Herb., *Zephyranthes* Herb., and *Sprekelia* Heist.

DISTRIBUTION: thirty-one species in Chile, Argentina and Bolivia.

KEY TO THE SPECIES OF **RHODOPHIALA**

1a. Stigma distinctly trifid:

Subgenus 1. **CHILANTHE**

2a. Perigone 6.7—11 cm. long:
  3a. Perigone 10—11 cm. long:
    Tepaltube 7.6 cm. long; peduncle 10cm. tall (Bolivia) ....1. *soratensis*
  3b. Perigone 6.7—8.5 cm. long (Note.—See also 14a and 15a, below, species with perigone 5—6.3 cm. long; if grown under good culture these might bridge the 4 mm. difference in length.)
    4a. Peduncle 30—90 cm. tall:
      Flowers polychrome: yellow-green-orange-vermilion; paraperigone of orange-yellow appendages at the base of filaments (Chile) ....2. *splendens*
    4b. Peduncle 20—22 cm. tall:
      Flowers lemon-yellow and red (Chile) ....3. *ananuca*
2b. Perigone 2.5—6.3 cm. long:
  5a. Umbel usually 3—6-flowered (many-flowered in R. tiltilensis); rarely 2-flowered in *R. advena* (11b), *R. jamesonii* (14a) and *R. bifida* (14b). [Note. —In case of 2-flowered umbels see also *R.* araucana (15a), *R. lineata* (16a), *R. elwesii* (17a) and *R. roseus* (20a).]
    6a. Tepalsegs formed into a pseudo-tube, and extending 1.4 cm. beyond mouth, apexes slightly reflexed (Chile) ....4. *tenuiflora*
    6b. Tepalsegs not formed into a pseudo-tube:
      7a. Flowers scarlet or scarlet and green:
        8a. Stamens almost as long as the perigone, flowers scarlet (Chile) 5. *consobrina*
        8b. Stamens up to 2/3 as long as the perigone; flowers scarlet (Chile) 6. *tiltilensis*
      7b. Flowers not scarlet or scarlet and green:
        9a. Flowers purple:
          Tepalsegs oblanceolate (Chile) ....7. *berteroana*
        9b. Flowers rose red and white, white, yellow red, or pink:
          10a. Perigone openly funnel-shaped:
            11a. Tepalsegs oblong; perigone yellow, tinged red (Chile) 8. *bagnoldii*
            11b. Tepalsegs oblong-acute; perigone white, yellow or red (Chile) 9. *advena*
          10b. Perigone funnel-shaped, or not widely open:
            12a. Perigone yellow:
              Stigmatic lobes short and thickened (Chile) ....10. *bakeri*
            12b. Perigone not yellow:
              13a. Perigone rose-red, white at base (Chile) ....11. *moelleri*
              13b. Perigone red or pink:
                14a. Tepalsegs oblong-acute (Argentina) ....12. *jamesonii*
                14b. Tepalsegs oblanceolate-unguiculate, obtuse (Agrentina) 13. *bifida*

1a. Peduncle up to 30 cm. tall:
11a. Spathe of two free valves ....13a. *bifida* var. *bifida*
11b. Spathe monophyllous ....13b. *bifida* var. *spathacea*
1b. Peduncle 6 cm. tall ....13c. *bifida* var. *pulchra*
5b. Umbel 1—2-flowered:
15a. Peduncle 30 cm. tall:
Perigone erect (Chile) ....14. *araucana*
15b. Peduncle 5—23 cm. tall:
16a. Flowers violet:
Stamens very short (Chile) ....15. *andicola*
16b. Flowers not violet:
17a. Tepalsegs yellow, lined red (Chile) ....16. *lineata*
17b. Tepalsegs not yellow, lined red:
18a. Flowers yellow with red throat (Argentina) ....17. *elwesii*
18b. Flowers red or yellow:
19a. Leaves 5 cm. long (Chile) ....18. *solisii*
19b. Leaves 15—30 cm. long:
20a. Bulb neck short, less than 2.5 cm. long (Chile) ....19. *roseus*
20b. Bulb neck 2.5—3.8 cm. long (Chile) ....20. *chilensis*
1b. Stigma obscurely trifid:

Subgenus 2. **RHODOPHIALA**

21a. Flowers yellow or a combination of red and yellow:
22a. Leaves 9—20 mm. wide:
Tepalsegs bright scarlet, tepaltube yellow (Chile) ....21. *fulgens*
22b. Leaves 3—4 mm. wide:
23a. Flowers entirely yellow (Chile) ....22. *montana*
23b. Flowers fiery-red, yellow toward base (Chile) ....23. *colona*
21b. Flowers not yellow or red and yellow:
24a. Umbel 2—5-flowered:
25a. Flowers red or violet-purple:
26a. Spathe-valves free, flowers bright red or violet purple (Chile)
24. *pratensis*
26b. Spathe-valves slightly united at base; flowers red (Argentina)
25. *gladioloides*
25b. Flowers rose at apex, paler towards base (Chile) ....26. *biflora*
24b. Umbel 1-flowered:
27a. Flowers white with a broad keel (Chile) ....27. *modesta*
27b. Flowers pink, red or purple:
28a. Peduncle about 5 cm. tall:
Flowers red (Chile) ....28. *uniflora*
28b. Peduncle 20—46 cm. tall:
29a. Perigone 3.5 cm. long:
Flowers purple (Chile) ....29. *purpurata*
29b. Perigone 7—7.6 cm. long:
30a. Tepalsegs bright red, tepaltube greenish (Chile) ....30. *rhodolirion*
30b. Tepalsegs pink, petaltube green (Chile) ....31. *popetana*

SPECIES NAMES AND SYNONYMY

1. Rhodophiala *soratensis* (Baker) Traub, in Plant Life *9:* 60. 1953. Syn.—*Hippeastrum soratense* Baker, Amaryll. 42. 1888; *Amaryllis soratensis* (Baker) T & U, in Herbertia *5:* 123. 1938; Traub & Moldk., Amaryllidac.: Tribe Amaryll. 95. 1949.

2. Rhodophiala splendens (Renjifo) Traub, in Plant Life *9:* 60. 1953. Syn.—*Habranthus splendens* Renjifo, in Renjifo & Phil., Descr. Alg. Pl. Nuev. reimpr. 6. 1884; Anal. Univ. Chile, p. 300, pl. 65. 1884;

Hippeastrum splendens (Renjifo) R. A. Phil., in Anal. Univ. Chile, *93:* 153. 1896; *Amaryllis splendens* (Renjifo) T & U, in Herbertia *5:* 131. 1938; *6(1939):* 150. 1940; Traub & Moldk., Amaryllidac.: Tribe Amaryll. 95. 1949.

3. RHODOLPHIALA ANANUCA (R. A. Phil.) Traub, in Plant Life *9:* 60. 1953. Syn.—*Hippeastrum ananuca* R. A. Phil., in Anal. Univ. Chile, *93:* 150. 1896; *Amaryllis ananuca* (R. A. Phil.) T & U, in Herbertia *5:* 130. 1938; *6(1939):* 149—150. 1940; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 90. 1949.

4. RHODOPHIALA TENUIFLORA (R. A. Phil.) Traub, in Plant Life *9:* 59. 1953. Syn.—*Hippeastrum tenuiflorum* R. A. Phil., in Anal. Univ. Chile, *93:* 154. 1896; *Amaryllis tenuiflora* (R. A. Phil.) T & U, in Herbertia *5:* 131. 1938; *6(1939):* 152. 1940; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 89. 1949.

5. RHODOPHIALA *consorbrina* (R. A. Phil.) Traub, in Plant Life *9:* 59. 1953. Syn.—*Hippeastrum consobrinum* R. A. Phil., in Anal. Univ. Chile *93:* 152. 1896; *Amaryllis consobrina* (R. A. Phil.) T & U, in Herbertia *5:* 131. 1938; *6(1939):* 150. 1940; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 88. 1949.

6. RHODOPHIALA *tiltilensis* (Traub & Moldk.) Traub, in Plant Life *9:* 59. 1953. Syn.—*Hippeastrum laetum* R. A. Phil., in Anal. Univ. Chile *93:* 151. 1896, non *Hippeastrum laetum* R. A. Phil., l. c. 157 (former rejected under Art. 75 of Code); *Amaryllis laeta* (R. A. Phil.) T & U, in Herbertia *5:* 131. 1938; *6(1939):* 153. 1940; *Amaryllis tiltilensis* Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 88. 1949.

7. RHODOPHIALA BERTEROANA (R. A. Phil.) Traub, in Plant Life *9:* 59. 1953. Syn.— *Habranthus berteroanus* R. A. Phil., in Linnaea *29:* 66. 1857-58; *Hippeastrum berteroanum* (R. A. Phil.) Baker, in Jour. Bot. Lond. *16:* 83. 1878; Amaryll. 44. 1888; *Amaryllis berteroana* (R. A. Phil.) T & U, in Herbertia *5:* 121. 1938; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 89—90. 1949.

8. RHODOPHIALA BAGNOLDII (Herb.) Traub, in Plant Life *9:* 59. 1953. Syn.—*Habranthus bagnoldii* Herb., in Bot. Reg. Lond. *17:* pl. 1396. 1831; Herb., in Amaryll. 162. 1837 (err. *H. bagnoldianus); Habranthus punctatus* Herb. Amaryll. 403. 1837; *Hippeastrum bagnoldii* (Herb.) Baker, in Jour. Bot. Lond. *16:* 83. 1878; Baker, Amaryll. 43. 1888; *Hippeastrum punctatum* (Herb.) R. A. Phil., in Anal. Univ. Chile *93:* 148. 1896; *Amaryllis bagnoldii* (Herb.) D. Dietr., in Syn. Pl. *2:* 1177. 1840; Steudel, in Nom. ed. *II(1):* 76. 1840 (err. *A. bangoldi);* T & U, in Herbertia *5:* 121. 1938; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 90. 1949.

9. RHODOPHIALA *advena* (Ker-Gawl.) Traub, in Plant Life *9:* 60. 1953. Syn.—*Amaryllis advena* Ker-Gawl., in Bot. Mag. Lond. *28:* pl. 1125. 1808; Bot. Reg. Lond. *10:* pl. 849. 1824; T & U, in Herbertia *5:* 122. 1938; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 91. 1949; *Hippeastrum advenum* (Ker-Gawl.) Herb., in Append. Bot. Reg. Lond. 31. 1821; *Habranthus pallidus* Lodd. Bot. Cab. *18:* pl. 1760. 1833; *Habranthus miniatus* D. Don ex Sweet, in Brit. Fl. Gard. 2nd. ser. *3:*

pl. 213. 1835; *Habranthus hesperius* Herb., in Amaryll. 161. 1837; *Amaryllis valparadisiaca* Steud., Nom. ed. *2(1):* 183. 1840; *Chlidanthus cumingii* Presl, Bot. Bemerk. 115. 1844; *Habranthus mendocinus* R. A. Phil., in Anal. Univ. Chile *2:* 406. 1892; *Myostemma advena* (Ker-Gawl.) Salisb., in Gen Pl. Gragm. 135. 1866; *Eustephia macleanica* Baker , in Saund. Refug. Bot. pl. 332, non auct. Herb. (1841) ; *Hippeastrum pallidum* Pax, in Bot. Jahrb. *11:* 321. 1890.

10. Rhodophiala bakeri (R. A. Phil.) Traub, in Plant Life *9:* 60. 1953. Syn.—*Habranthus bakeri* R. A. Phil., in Anal. Univ. Chile *93:* 150. 1896; T & U, in Herbertia *5:* 130. 1938, sphalm., *Hippeastrum bakeri; Amaryllis bakeri* (R. A. Phil.) T & U, in Herbertia *5:* 130. 1938; *6(1939):* 151. 1940; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 91. 1949.

11. Rhodophiala moelleri (R. A. Phil.) Traub, in Plant Life *9:* 59. 1953. Syn.—*Hippeastrum moelleri* R. A. Phil., in Anal. Univ. Chile *93:* 154. 1896; *Amaryllis moelleri* (R. A. Phil.) T & U, in Herbertia *5:* 131. 1938; *6(1939):* 150. 1940; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 89. 1949.

12. Rhodophiala *jamesonii* (Baker) Traub, in Plant Life *9:* 60. 1953. Syn.—*Hippeastrum jamesonii* Baker, in Jour. Bot. Lond. *16:* 83. 1878; Baker, Amaryll. 44. 1888; *Amaryllis jamesonii* (Baker) T & U, in Herbertia *5:* 121. 1938; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 92. 1949.

13. Rhodophiala bifida (Herb.) Traub, in Euclides *13:* 156. 1953. Syn.—*Habranthus bifidus* Herb., in Bot. Mag. Lond. *52:* pl. 2597. 1825; *Habranthus angustus* Herb., in Bot. Mag. Lond. *53:* pl. 2639. 1826; *Amaryllis bifida* (Herb.) Sprengel, in Syst. Veg. Cur. Post. *4(2):* 133. 1827; T & U, in Herbertia *5:* 122. 1938; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 92. 1949; *Amaryllis intermedia* Lindl., in Bot. Reg. Lond. *14:* pl. 1148. 1928; *Amaryllis kermesina* Lindl., in Bot. Reg. *91:* pl. 1638. 1834; *Habranthus kermesianus* (Lindl.) Herb., Amaryll. 159. 1837; *Habranthus intermedius* (Lindl.) Herb., Amaryll. 160. 1837; *Habranthus lorifolius* Herb., Amaryll. 160, in obs. 1837; *Habranthus nemoralis* Herb., Amaryll. 159. 1837; *Habranthus pedunculosus* Herb., Amaryll. 161, pl. 26, fig. 1. 1837; *Amaryllis lorifolia* (Herb.) Steud., Nom. ed. *2(1):* 71. 1840; *Habranthus nobilis* Herb., in Bot. Reg. Misc. 88. 1844; *Amaryllis angusta* (Herb.) Schult. f., Syst. Veg. *7:* 808. 1850; *Hippeastrum bifidum* (Herb.) Baker, in Jour. Bot. Lond. *16:* 83. 1878; Amaryll. 43. 1888; *Hippeastrum pedunculosum* (Herb.) Holmb., in Anal. Mus. Nac. Buenos Aires, ser III. *5:* 146 1905.

13a. Rhodophiala bifida var. bifida (see no. 13, above.)

13b. Rhodophiala bifida var. spathacea (Herb.) Traub, *var. nov.* Syn.—*Habranthus spathaceus* Herb., in Bot. Mag. Lond. *52:* sub pl. 2597. 1825; *Amaryllis spathacea* (Herb.) Schult. f., Syst. *7:* 808. 1830; *Hippeastrum platense* Holmb., in Anal. Mus. Nac. Buenos Aires, ser. III. *5:* 146. 1905; *Amaryllis platensis* (Holmb.) T & U, in Herbertia *5:* 129 1938; *Amaryllis bifida* var. *spathacea* (Herb.) Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 93. 1949.

13c. RHODOPHIALA BIFIDA var. PULCHRA, (Herb.) Traub, *var. nov.* Syn.—*Habranthus pulcher* Herb., in Amaryll. 161, pl. 26, fig. 1. 1837; *Hippeastrum pulchrum* (Herb.) Holmb., in Anal. Mus. Nac. Buenos Aires, ser. III. *5:* 145. 1905; Amaryllis *pulchra* (Herb.) T & U, in Herbertia *5:* 122. 1938; *Amaryllis bifida* var. *pulchra* (Herb.) Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 93. 1949.

14. RHODOPHIALA ARAUCANA (R. A. Phil.) Traub, in Plant Life *9:* 60. 1953. Syn.—*Hippeastrum araucanum* R. A. Phil., in Anal. Univ. Chile *93:* 152—153. 1896; *Amaryllis araucana* (R. A. Phil.) T & U, in Herbertia *5:* 130. 1938; *6(1939):* 151—152. 1940; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 94. 1949.

15. RHODOPHIALA ANDICOLA (Poeppig) Traub, in Plant Life *9:* 60. 1953. Syn.—*Habranthus andicolum* (Poeppig) Baker, in Jour. Bot. Lond. *16:* 82. 1878; *Zephyranthes andicola* (Poeppig) Baker, in Amaryll. 36. 1888; *Amaryllis andicola* Poeppig, in Fragm. Syn. Pl. Phan. 5. 1833; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 96. 1949.

16. RHODOPHIALA LINEATA (R. A. Phil.) Traub, in Plant Life *9:* 60. 1953. Syn.—*Habranthus lineatus* R. A. Phil., in Anal. Univ. Chile *43:* 542. 1873; *Hippeastrum lineatum* (R. A. Phil.) Baker, in Jour. Bot. Lond. *16:* 82. 1878; Baker, in Amaryll. 42. 1888; *Amaryllis lineata* (R. A. Phil.) T & U, in Herbertia *5:* 122. 1938; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 96. 1949.

17. RHODOPHIALA ELWESII (C. W. Wright) Traub, in Plant Life *9:* 60. 1953. Syn.—*Hippeastrum elwesii* C. W. Wright, in Kew Bull. 330. 1914; Bot. Mag. Lond. *CXLI:* pl. 8614. 1915; *Amaryllis elwesii* (C. W. Wright) T & U, in Herbertia *5:* 121. 1938; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 96. 1949.

18. RHODOPHIALA FLAVA (R. A. Phil.) Traub, in Plant Life *9:* 60. 1953. Syn.—*Habranthus flavus* R. A. Phil., in Anal. Univ. Chile *27:* 333. 1865; *Hippeastrum solisii* R. A. Phil., in Anal. Univ. Chile *93:* 155. 1896; *Amaryllis flava* (R. A. Phil.) T & U, in Herbertia *6(1939):* 150-151. 1940, non auct. Pav. ex Roem. & Schult.; *Amaryllis solisii* (R. A. Phil.) T & U, in Herbertia *5:* 131. 1938.

19. RHODOPHIALA ROSEA (Sweet) Traub, in Plant Life *9:* 60. 1953. Syn.—*Habranthus roseus* Sweet, in Brit. Fl. Gard. ser. 2. *2:* pl. 107. 1833; Herb. in Amaryll. 163. 1837; *Habranthus pumilus* Lodd., in Bot. Cab. *18:* pl. 1771. 1831; Herb. Amaryll. 167. 1837; *Hippeastrum roseum* (Sweet) Baker, in Jour. Bot. Lond. *16:* 82. 1878; *Zephyranthes purpurata* R. A. Phil., in Linnaea *29:* 65. 1857-58; *Amaryllis rosea* (Sweet) T & U, in Herbertia *5:* 122. 1938, non auct. Lamarck 1783; *Amaryllis barlowii* Traub & Moldk., in Amaryllidac.: Amaryll. 97. 1949.

20. RHODOPHIALA CHILENSIS (L'Herit.) Traub, in Plant Life *9:* 95. 1953. Syn.—*Amaryllis chilensis* L'Hérit., in Sert. Angl. 11. 1788, non auct. Ruiz & Pav.; Poeppig, Fragm. Syn. Pl. Phan. 5. 1833; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 95. 1949; *Amaryllis chloroleuca* Ker-Gawl. in Jour. Sci. & Arts, *2:* 347, pl. 8, fig. 1. 1817; *Zephyranthes chloroleuca* (Ker-Gawl.) Herb., in Append. Bot. Reg. Lond. 36. 1821; *Amaryllis ochroleuca* Ker-Gawl. ex Herb., in Amaryll. 164, in obs., pl. 45,

Fig. 6 *(A. chloroleuca)*. 1837; *Habranthus chilensis* (L'Hérit.) Herb., in Amaryll. 163-164. 1837; *Hippeastrum chilense* (L'Hérit.) Baker, in Jour. Bot. Lond. *16:* 82. 1878; Baker, in Amaryll. 42. 1888.

21. Rhodophiala fulgens (J. D. Hooker) Traub, in Plant Life *9:* 60. 1953. Syn.—*Habranthus fulgens* J. D. Hooker, in Bot. Mag. Lond. *92:* pl. 5563. 1866; *Hippeastrum fulgens* (J. D. Hooker) R. A. Phil., in Anal. Univ. Chile *93:* 151-152. 1896; *Amaryllis fulgens* (J. D. Hooker) T & U, in Herbertia *6(1939):* 153. 1940.

22. Rhodophiala montana (R. A. Phil.) Traub, in Plant Life *9:* 60. 1953. Syn.—*Habranthus montanus* R. A. Phil., in Anal. Univ. Chile *43:* 542-543. 1873 (reimp. 66.1873); *Hippeastrum montanum* (R. A. Phil.) Baker, in Jour. Bot. Lond. *16:* 83. 1878; *Amaryllis montana* (R. A. Phil.) T & U, in Herbertia *5:* 123. 1938; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 99. 1949.

23. Rhodophiala colona (R. A. Phil.) Traub, in plant Life *9:* 60. 1953. Syn.—*Hippeastrum colonum* R. A. Phil., in Anal. Univ. Chile *93:* 148. 1896; *Amaryllis colona* (R. A. Phil.) T & U, in Herbertia *5:* 130. 1938; *6(1939):* 152. 1940, err. *A. coloniana;* Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 100. 1949.

24. Rhodophiala pratensis (Poeppig) Traub, in Taxon *1:* 122. 1952. Syn.—*Amaryllis pratensis* Poeppig, in Fragm. Syn. Pl. Phan. 5. 1833; T & U, in Herbertia *5:* 123. 1938; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 99. 1949; *Habranthus speciosus* Herb., in Amaryll. 158. 1837; *Habranthus pratensis* (Poeppig) Herb., in Bot. Reg. Lond. pl. 35. 1842; *Rhodophiala amarylliodes* Presl, in Bot. Bemerk. 115. 1844; *Rhodophiala leata* R. A. Phil., in Fl. Atac. 51. 1860; Anal. Univ. Chile *43:* 544. 1873; *Rhodophiala volckmannii* R. A. Phil., in Linnaea *33:* 259. 1864-65; *Hippeastrum pratense* (Poeppig) Baker, in Jour. Bot. Lond. *16:* 83. 1878; Amaryll. 46. 1888; *Placea pratensis* Poeppig ex F. Phil., in Poeppig, Fragm. Syn. Pl. Phan. 5. 1883 (in synon.) et F. Phil., in Cat. Pl. Vasc. Chile, 291, 1881, in synon.; Baker, in Amaryll. 46. 1888, in synon; *Hippeastrum laetum* R. A. Phil., in Anal. Univ. Chile *93:* 157. 1896, non *Hippeastrum laetum* R. A. Phil. l. c. 151; *Stephanoma elegans* Kunze *(sic)*, in Baker, Amaryll. 46. 1888, in synon.; *Amaryllis atacamensis* T. & U, in Herbertia *6(1939):* 151. 1940.

25. Rhodophiala gladioloides (Hieron.) Traub, in Plant Life *9:* 60. 1953. Syn.—*Habranthus gladioloides* Hieron., in Bol. Acad. Nac. Cien. Cordoba *4:* 70. 1881; *Hippeastrum gladioloides* (Hieron.) Pax, in Engl. Jahrb. *11:* 321. 1890; *Amaryllis gladioloides* (Heiron.) T & U, in Herbertia *5:* 120. 1938; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 100. 1949.

26. Rhodophiala biflora R. A. Phil., in Linnaea *29:* 66-67. 1857-58. Syn.—*Amaryllis biflora* (R. A. Phil.) Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 101. 1949.

27. Rhodophiala modesta R. A. Phil., in Anal. Univ. Chile *34:* 544. 1873. Syn.—*Hippeastrum modestum* (R. A. Phil.) Baker, in Jour. Bot. Lond. *16:* 83. 1878; Baker, Amaryll. 45. 1888; *Amaryllis modesta* (R. A.

Phil.) T & U, in Herbertia *5:* 123. 1938; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 101. 1949.

28. Rhodophiala uniflora R. A. Phil., in Fl. Atac. 51. 1860. Syn.—*Rhodolirion montanum* R. A. Phil., in Linnaea *19:* 65. 1857-58; *Hippeastrum uniflorum* (R. A. Phil.) Baker, in Jour. Bot. Lond. *16:* 83. 1878; Amaryll. 45. 1888; *Amaryllis uniflora* (R. A. Phil.) T & U, in Herbertia *5:* 123. 1938; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 101. 1949.

29. Rhodophiala purpurata (R. A. Phil.) Traub, in Plant Life *9:* 60. 1953. Syn.—*Hippeastrum purpuratum* R. A. Phil., in Anal. Univ. Chile *93:* 156. 1896; *Amaryllis purpurata* (R. A. Phil.) T & U, in Herbertia *5:* 131. 1938; *6(1939):* 151. 1940; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 102. 1949.

30. Rhodophiala rhodolirion (Baker) Traub, in Plant Life *9:* 60. 1953. Syn.—*Rhodolirion andinum* R. A. Phil., in Linnaea *19:* 65. 1857-58, *Hippeastrum andinum* (R. A. Phil.) R. A. Phil., in Anal. Univ. Chile *93:* 158. 1896; *Hippeastrum rhodolirion* Baker, in Jour. Bot. Lond. *16:* 84. 1878; Amaryll. 45. 1888; *Amaryllis rhodolirion* (Baker) T & U, in Herbertia *5:* 123. 1938; Traub & Moldk., in Amaryllidac.; Tribe Amaryll. 102. 1949.

31. Rhodophiala popetana (R. A. Phil.) Traub, in Plant Life *9:* 60. 1953. Syn.—*Hippeastrum popetanum* R. A. Phil., in Anal. Univ. Chile *93:* 156. 1896; *Amaryllis popetana* (R. A. Phil.) T & U, in Herbertia *5:* 131. 1938; *6(1939):* 1940; Traub & Moldk., in Amaryllidac.; Tribe Amaryll. 102. 1949.

EXCLUDED SPECIES

Rhodophiala andina R. A. Phil., in Anal. Univ. Chile *43:* 543. 1873. = *Phycella herbertiana* Lindl., in Bot. Reg. Lond. *16:* pl. 1341. 1830.

GENUS PHYCELLA Lindl.,

in Bot. Reg. Lond. *11:* sub pl. 928 (supra vol. 10, fol. 809. 1824). 1825; Herb., in Amaryll. 151. 1837.

Diagnosis.—*Bulbous* perennials; leaves narrow-linear, 3—13 mm. wide; flowers borne in umbels on a leafless peduncle; *umbel* usually 3—12-flowered, rarely 2-flowered; spathe-valves 2, free, linear, lanceolate or obtuse; *pedicels* slender, variable in length; *ovary* 3-loculed; *ovules* numerous in each locule; *perigone* declined, usually narrowly funnel-shaped; tepalsegs 6, regular, convolute, pomegranate red, bright red, purple, or scarlet, or two-toned red and yellow, or yellowish-green; *tepaltube* usually very short, rarely up to 9 mm. long; *stamens* 6, distinct, alternately equal, inserted alike at the mouth of the tepaltube, descending, straight, recurved at the apex; anthers short, versatile; filaments usually provided with subulate processes or cilia; *style* sloping downwards, longer than the stamens; *stigma* obscurely trifid or capitate; fruit a loculicidally dehiscing capsule; seeds numerous, flattened, black.

Type species: *Phycella ignea* (Lindl.) Lindl. (1825). Syn.—*Amaryllis ignea* Lindl., (1824).

Phylogenetic position: *Amaryllidaceae,* tribe *Eustephieae,* near *Eustephia* Cav., *Castellanoa* Traub, *Eustephiopsis* Fries, and *Hieronymiella* Pax.

Distribution: seven species ranging from Peru, Chile, Argentina and Uruguay.

EXCLUDED SPECIES

Phycella chloracra Herb., in Amaryll. 155. 1837, and *P. obtusa* Lindl., in Bot. Reg. Lond. Misc. 91. 1844 = *Phaedranassa chloracra* Herb.

Phycella macleanica Baker, in Saund. Refg. Bot. pl. 332. = *Rhodophiala advena* (Ker-Gawl.) Traub.

SPECIES NAMES AND SYNONOMY

1. Phycella granatiflora (Holmb.) Traub, in Plant Life *9:* 62. 1953. Syn.—*Hippeastrum granatiflorum* Holmb., in Anal. *Mus.* Buenos Aires, ser. III. *2:* 79-80. 1903; *Amaryllis granatiflora* (Holmb.) T & U, in Herbertia *5:* 120. 1938; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 104. 1949.

2. Phycella phycelloides (Herb.) Traub, in Plant Life *9:* 60. 1953. Syn.—*Habranthus phycelloides* Herb., in Bot. Reg. Lond. *17:* pl. 1417. 1831; *Hippeastrum phycelloides* (Herb.) Baker, in Jour. Bot. Lond. *16:* 83. 1878; Amaryll. 44. 1888; Kuntze, in Rev. Gen. Pl. *3(3):* 310. 1898; *Amaryllis phycelloides* (Herb.) Steud., in Nom. ed. *2(1):* 72. 1840; T & U, in Herbertia *5:* 121. 1938; Traub & Moldk., in Amaryllida.c: Tribe Amaryll. 104. 1949.

3. Phycella bonariensis (O. Kuntze) Traub, in Plant Life *9:* 60. 1953. Syn.—*Hippeastrum bonariense* O. Kuntze, in Rev. Gen. Pl. *3(3):* 311. 1898; *Amaryllis bonariensis* (O. Kuntze) T & U, in Herbertia *5:* 120. 1938; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 105. 1949.

4. Phycella gayana (O. Kuntze) Traub, in Plant Life *9:* 62. 1953. Syn.—*Hippeastrum gayanum* O. Kuntze, in Rev. Gen. Pl. *3(3):* 311. 1898; *Amaryllis gayana* (O. Kuntze) T & U, in Herbertia *5:* 121. 1938; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 105. 1949.

5. Phycella herbertiana Lindl., in Bot. Reg. Lond. *16:* pl. 1341. 1830. Syn.—*Rhodophiala andina* R. A. Phil., in Anal. Univ. Chile *43:* 543. 1873; *Hippeastrum andinum* (R. A. Phil.) Baker, in Jour. Bot. Lond. *16:* 84. 1878; *Hippeastrum herbertianum* (Lindl.) Baker, in Jour. Bot. Lond. *16:* 83. 1878; Amaryll. 45. 1888; *Amaryllis herbertiana* (Lindl.) T & U, in Herbertia *5:* 121. 1938; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 105. 1949.

6. Phycella angustifolia R. A. Phil., in Anal. Univ. Chile *43:* 543. 1873. Syn.—*Hippeastrum angustifolium* (R. A. Phil.) R. A. Phil., in Anal. Univ. Chile *93:* 158. 1896; *Amaryllis philippiana* T & U, in Herbertia *5:* 130. 1938; *6(1939):* 152. 1940; Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 106. 1949.

7. Phycella bicolor (Ruiz & Pav.) Herb., in Amaryll. 154. 1837. Syn.—*Amaryllis bicolor* Ruiz & Pav., in Pl. Peru et Chil., *3:* 57. 1802; T & U, in Herbertia *5:* 121. 1938; Traub & Moldk., in Amaryllidac.:

Tribe Amaryll. 106. 1949; *Amaryllis cyrtanthoides* Sims, in Bot. Mag. Lond. pl. 2399; *Amaryllis ignea* Lindl., in Bot. Reg. Lond. *10:* pl. 809. 1824; *Phycella ignea* (Lindl.) Lindl., in Bot. Reg. Lond. sub. pl. 928 (supra vol. 10, fol. 809. 1824). 1825; *Phycella cyranthoides* (Sims) Lindl., in Bot. Reg. Lond. *11:* sub pl. 928 (supra vol. 10, fol. 809. 1824). 1825; *Phycella glauca* Lodd., in Bot. Cab. *18:* pl. 1746. 1831; *Phycella attenuata* Herb., in Amaryll. 153. 1837; *Phycella graciliflora* Herb., in Amaryll. 152, pl. 25, fig. 4. 1837; *Phycella magnifica* Herb., in Amaryll. 152. 1837; *Phycella brevituba* Herb., in Amaryll. 154. 1837; *Phycella corusca* Lindl., in Bot. Reg. Lond. Misc. 43. 1838; *Amaryllis demissa* Steud., in Nom. ed. 2, *1:* 71. 1841; *Phycella macraeana* Pritz., in Ic. Ind. *1:* 838. 1855; *Phycella obtusifolia* Pritz., in Ic. Ind. *1:* 838. 1855; *Hippeastrum bicolor* (Ruiz & Pav.) Baker, in Jour. Bot. Lond. *16:* 83. 1878; Amaryll. 44. 1888; *Amaryllis magnifica* (Herb.) Vilmorin, in Blumeng., ed. 3, Sieb. & Voss, *1:* 1031. 1895.

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Traub, Hamilton P. and Harold N. Moldenke. *Amaryllidaceae:* Tribe *Amarylleae.* 1949.

[IN MEMORIAM—HERMON BROWN, continued from page 16.]

made yearly calls to visit Mr. and Mrs. Brown for not only were his own strains of hybrid amaryllis worth the trip to see but this couple were themselves so friendly that one left them knowing that he had made two more real friends. He was 82 and is survived by his most gracious wife and a son, Leland H. Brown who is a professor of engineering at Stanford University. Coming to California from Kansas he was trained as a horticulturist in 1898. In 1900 he became curator of the Salisbury Public and Experimental Gardens, of Salisbury, Rhodesia, South Africa where he presided for twelve years. Returning to Gilroy, California he became an orchardist. He organized the San Jose and Gilroy Flower Lover's Club. Each year he held an exhibit of hybrid amaryllis that attracted Statewide interest and attendance. Subsequently in 1952 he moved to Palo Alto to be with his children but maintained his hybridizing experiments to the very last. There are many of you who will feel the loss of this gentleman as a personal one. There are few who kept such a long interest in hybrid amaryllis, producing them not only commercially but maintaining constant efforts to improve strains as a personal hobby.—*Robert G. Thornburgh, M.D.*

3. GENETICS AND BREEDING

NOTES ON **AMARYLLIS** BREEDING

J. F. Stewart, *California*

In the earlier years of our Amaryllis growing, the number of breeding-stock bulbs in bloom at any one time was very limited, and it was necessary to use whatever pollen was available on whatever bulbs were in bloom. As a result of this only a few of the crosses were within the color groups, and the balance were mixed, which resulted in good stock but unpredictable colors. During the last few years the crosses have been mostly within the color groups, with mixed crosses for experimental purposes only, and the following notes are based on first mentioned crosses.

Only those bulbs having characteristics we wish to perpetuate are used for parents, but, while the stock as a whole is immensely improved, we have not yet established any known continuity of strains.

To date there has been little inbreeding of clones, but next year there should be enough blooms of a few clones to permit a program of in-breeding.

Our cross-pollinating is done in five color groups; red, white, pink, salmon, and striped. All pollen from red blooms is kept in one container, all from whites in another, etc., and the containers kept in the refrigerator when not in use. Ripe pollen is added as it is stripped, and every two or three weeks, depending upon the abundance of fresh pollen, the containers are cleaned out and a fresh start made. I have no information on the life of pollen, but it seems to be good for a couple of weeks. Some experimenting to determine pollen life should be of interest. Pollen not to be used for breeding is stripped from the blooms before it is ripe and is destroyed. In the field there could be some contamination of crosses because we occasionally miss a bloom, but in the glass house the control is close, and we will do very little hand pollinating in the field from now on.

A few years ago a number of bulbs from a planting of Dutch pink and salmon seeds bloomed as two-year-olds. These were inter-pollinated and the stock kept isolated in the hope that the early blooming characteristic would be transmitted, but there has been no indication of it. The seedlings did show that the pink and salmon colors would blend to some extent, for there are a number of salmon-pinks, or pink-salmons, among them.

After having read of Mr. J. T. Weisner's experience with white giants, I did some experimenting on my own. There were seven in bloom in the glass house in late August and early September, which were interpollinated, but not one seed developed.

Our white seedlings are the most prolific multipliers and profuse bloomers of all the bulbs we have. Most of them, in the glass house, bloom twice a year, and some of them three times. There are some buds now, in late October, which should be in bloom around the holidays. They have been coming almost one hundred percent pure white, except for some green of course, and tend to be of loose, informal shapes. There is one strain that crops up occasionally, with a definitely formal shape, but with rather narrow and somewhat spoon shaped tepalsegs that are a pure smooth white, with apple green at the center. This is not a particularly desirable flower but might add something to the stock. The whites are good propagators. The flowers do not do too well in the open field, apparently being sensitive to the hot sun and the wind.

The salmons do not bloom as often or multiply as freely as the whites, but they produce a larger percentage of seedlings with gorgeous high grade blooms than any of the other colors. They come generally true to color and propagate well.

The pinks, of the 'Pink Perfection' type come reasonably true to color, but with a great variety of shapes and sizes. Some of the largest ones have quite narrow tepalsegs. They propagate fairly well, but multiply less freely than some others. The only other pinks I have propagated by cuttings are 'Fidelity' which does not do well for me, and 'Sweet Seventeen', which does.

The stripes, particularly those which have the color on the center portion of the tepalsegs and the white on the edges, as differentiated from those bi-colors that have the colored tepalsegs with white markings, are the most difficult of all for me to reproduce by seeds. There must be some cross-breeding technique required for these which I have not yet learned. They propagate well, in general do not multiply too freely, and are liable to be slow to bloom. We have some beautiful specimens in this group. They come in all colors, and tend towards the informal in shape. They are eye-catchers and are more vivid and sharp from a distance than the solid colors.

The reds of course, comprise the greater part of our stock. The seedlings seem to reflect the great variety of stock in their background, having an infinite variety of shape, size, texture, and color depth, many being discarded. We get a large percentage of solid colors. They propagate well, and, mostly, multiply freely, although it seems to be the rule that the better the bloom, the fewer the offsets.

Part of our seeds are usually planted in the ground in the glass house, and part outdoors, with the glass house planting showing better germination and faster growth. They are transplanted to the field when a year old, as also are the out door seedlings. This transplanting is done with the greatest of care, as it is possible to lose a lot of the plants at this stage. We grow them in double rows on ridges three feet on centers, and use surface irrigation in the furrows.

Cross pollinating produces more and stronger seeds than in-breeding. Early planting of seeds is advantageous in at least two ways;—there will be a longer growing period before the winter dormant season, or frost, and there seems to be a relationship between early planting and high germination, although the seeds will carry over into the following season if well cared for. A few thousand of last year's seeds were planted out doors this year, as an experiment, and germination was fair. The seeds, when gathered, are kept in paper bags, and one year the pods and all were put in. Due to the moisture remaining in the pods, and the natural heat, many of the seeds had sprouted in the bags before the condition was discovered.

TWENTY-EIGHT YEARS WITH **AMARYLLIS**

CHAS. SNYDER, *California*

My *Amaryllis* strain originated when I bought 50 one year old bulblets from Mr. Woodruff, a bulb grower at Encinitas, California, 28 years ago. Mr. Woodruff had worked in the Government greenhouses in Washington, D. C., hybridizing *Amaryllis,* and when he retired he was given some Amaryllis seeds for use in his experiments. Mr. Woodruff later sold his place and moved to Arizona where he passed away. The bulblets obtained were planted at Laguna Beach, and thus my strain was on its way.

Every three years I dug and replanted the large bulbs and the offsets, also we found quite a lot of self-sown seedlings which we saved and planted separately from the others and when they bloomed I discovered that many new ones had been added to my strain. I also planted a large bed closely set with alternating Hybrid *Amaryllis* and *Brunsvigia rosea* (Cape Belladonna) thus insuring two blooming periods and foliage the year round. In January 1945, I had no more room for expanding so I contacted Mr. Cecil Houdyshel of La Verne, California and sold him 2000 large bulbs many of them 3″ x 4″ in diameter. Mr. Houdyshel then sent in my name for membership in AMERICAN AMARYLLIS SOCIETY and I secured all back numbers of HERBERTIA to 1934.

In October 1945, I sold to Mr. Wm. E. Rice of Downey, California 8000 bulbs; 2½″ minimum and many were 3″ x 4″ in diameter. In looking over Mr. Rice's plantings at that time I felt sure that he must have secured the balance of Mr. Woodruff's bulbs. In 1945 (Spring), I planted a bed of 1000 selected large bulbs and from them I saved seed and planted them in August 1945. I subdivided my garden in 1946 and sold off lots containing all my offsets, but reserved 250 of the bulbs from the bed of 1000, and the 1945 seed bed was on a lot I still owned.

In January 1947, I planted on my orange grove in Alta Loma, California the 250 large bulbs and also 1350 bulblets from 1945 seed. I saved seed from the 250 bulbs and on account of trying to raise them in field beds I lost all of my 1947—1948 seedlings. From my 1949 seeds I raised about 5000 bulblets and when they bloomed in 1954 they proved to be my best strain.

Mr. H. Bruse Claffin of Upland, California did some hand hybridizing on my old strain in 1953, securing some 20,000 seeds, most of these should bloom in the spring of 1956. This spring (1955) Mr. Claffin bought about 100 of the best Holland bulbs and bloomed them in his hot house and used the pollen on my field grown strain and produced 40,000 seeds. In another year or two we can see the results.

In the spring of 1955 I tried an experiment with cut flowers, I contacted a shipper in Los Angeles and during the blooming season shipped air express 2500 stems with fair returns.

All Hybrid Amaryllis are beautiful to me because of their forms and the hundreds of different combinations of colors. As yet I have not segregated my bulbs as to color and all the bulbs I have sold to date have been mixed colors.

NARCISSUS NOTES — 1955

J. S. Cooley, *Maryland*

Some years ago I made some *Narcissus* crosses with the objective of producing an early variety that would meet our requirements better than the present varieties. One of the earliest daffodils to bloom here is 'February Gold.' It is a rich color and the blossoms are quite resistant to cold. However the flowers are small and the stem usually short, thus precluding its use by the florist. Another early blooming variety commercially grown here is 'The First,' which has a large flower and a long stem, but it is much more susceptible to freezing injury than 'February Gold.' The necks freeze to death during a cold spell while 'February Gold' may not be injured. Another objection to 'The First' is that during cool frosty weather the blooms do not open out fully. Both of these varieties persist well from year to year. Some of the early varieties such as 'Forerunner' do not persist well from season to season. The old variety 'Golden Spur' does not persist well and is too poor a flower to compete with some of the newer varieties. We need a long trumpet variety that is both early and resistant to the cold and also persists well from one season to the next.

In attempting to produce such a variety I crossed the species *minor* with some of the early long trumpets such as 'Henry Irwin.' The progeny from such crosses gave early blooming plants—some earlier than any other daffodils in our garden. The flowers were much more resistant to cold than 'The First' but the stems were too short and the flowers not so large as 'The First.' I am expecting to use these early blooming seedlings as parents for further pollination work in an endeavor to produce a variety that meets our present needs better than what we now have.

BREEDING MINIATURE DAYLILIES

Stanley E. Saxton, *New York*

There are four species of *Hemerocallis* which are of dwarf or near dwarf stature. Three of these; *H. nana*, *H. plicata*, and *H. forrestii*, belong to the subdivision having scapes shorter than the foliage. In the wild these three seldom exceed 12″ in height of space. When grown under good culture in garden or greenhouse the scapes may attain a height of 16″ or more. In all of these the branching is at the top of the scapes and the inflorescence may have from one to several flowers. The flowers are 3″ or more in width. None of these three species are reliably hardy in the north temperate zone and their sparse flowering habit makes them undesirable for garden decoration.

The fourth dwarf species is *H. minor,* is hardy, and under good culture produces many 12″ stems, each with several 3″ lemon yellow flowers. It blooms shortly after *H. flava,* and is useful in the rock garden or front of the border. Its blooming period is rather short, and the arching stems tend to drag the flowers on the ground in rainy weather.

None of the above produce what the writer considers 'miniature' type flowers. The ideal toward which my breeding program has been planned is a plant of dwarf habit, hardy, producing many stems about 20″ tall, with good branching which will produce 15 to 20 flowers over a season of 3 or 4 weeks. The flowers must be small, preferably around 2″ in span and in a variety of colors and types.

In the book ''Daylilies'' (Dr. A. B. Stout-1934) a dwarf selection in deep fulvous red tones named 'Nada' was described as having flowers 4½″ in spread, and pictured as being about 8″ tall. In 1940 I visited Dr. Stout at the N. Y. Botanical Gardens and enquired about 'Nada.' Dr. Stout asked me to walk into the gardens and showed me this hybrid in bloom. The scapes on an established plant were nearly 3′ tall. This hybrid was therefore never introduced.

In 1941 the Farr Nursery Co. offered the miniature 'Mignon.' This had been developed by introducing H. multiflora into the dwarf line. I consider 'Mignon' a true miniature. It conforms to most of the specifications mentioned above. I felt that if more attractive colors and forms could be obtained in a flower this size, and on even shorter stems ('Mignon' is about 30″ tall), that then a race of minature daylilies suitable for edging or rock gardens could be offered to the gardener.

I obtained 'Mignon' in 1941 and began a series of breeding prorams using it with *H. minor* and various other low growing and small flowered hybrids.

For some time the results seemed good and some plants were even named, but the same difficulties dogged my efforts as had discouraged Dr. Stout with 'Nada'. For the first few years the hybrids would remain dwarf; then, given a richer fare or better location, the plants would stretch their stems to unwanted heights. By 1948 my selections were showing some promise, and I planted out a group of selections which had flowered from 1½″ to 2½″ in span on 18″ to 24″ stems for observation. These were allowed to grow in undisturbed clumps for 5 years in order to prove their eventual height when established.

The first plant to be introduced from this series was 'Pinocchio'. This was offered in 1950 before it had been given extensive observation. 'Pinocchio' is a pastel bitone with a light red eye zone on the petals. The flowers are about 2″ in spread, and are borne rather profusely on

24″ to 30″ multiflora type stems which are small and wiry but hold the flowers erect. This plant blooms early, shortly after *H. flava,* and the flowers remain in good condition from the time they open in late afternoon until the following evening. Since two sets of flowers are open in the evening the garden effect at that time is especially fine. The flowers from the previous day will have faded some so that the plant appears to have flowers of two differing shades of color. In addition to this extended bloom 'Pinocchio' gives creditable repeat bloom in the early autumn. It is completely dormant in habit and may prove more dwarf in warmer locations. Here in the north the stems have risen sometimes to 3′ in height and for that reason efforts have been continued to produce hybrids of lower stature.

In 1956 Saxton Gardens will introduce three additional miniature selections. These are all more dwarf than 'Pinocchio', the stems here having seldom risen to more than 24″ at the most, and often have been shorter. They retain good branching and the flowers are uniformly about 2″ in spread. All of these have the grasslike foliage and small fans of H. multiflora and H. minor and give the best showing when the clumps have become rather crowded. They are all fully dormant with shoots submerged during the winter months. The flowers are nicely formed, of open, slightly recurved type, the petals wide enough to give the flowers a solid compact effect. 'Jingle' is a light red self, the lowest growing of all. 'Tinkle' is a pastel with a flush of pink on the petals. It is similar in color effect to the daylily 'Serenade'. 'Wink' is a light peach toned flower with a bright red halo, or eye at the throat.

A bright velvety red miniature has been named 'Toy' and will be introduced later.

It may be of interest to note here that our miniature pink daylily 'Pinkie' seems to have been a whim of nature. It is not the result of breeding in the dwarf or miniature line, but rather comes from a line of breeding planned for the production of pink daylilies. None of the other plants in this progeny proved dwarf, although flowers on some of them were rather small. We have not used 'Pinkie' extensively in the miniature breeding program since it is undoubtedly dominant for larger flowers and taller growth.

HEMEROCALLIS OF THE FUTURE

George Gilmer, *Virginia*

I am not a prophet. But I have grown over 800 named varieties during the last 25 years. Every year recently and most years in the past I bought some new varieties the year they were introduced. The direction of change over the past years will probably continue for some years to come. If we know how they have developed we may project the course of improvement into the future with a good chance of being right or nearly so.

POLYPLOIDS. The greatest hope of a sudden improvement is in the new polyploid varieties, produced by colchocine. The plants I have seen have been greatly improved. Petals are often doubled in width and greatly increased in substance. The polyploids I have had and seen have been developed from varieties I have discontinued as surpassed by newer ones. Where they are crossed with the diploid they produce improved sterile triploids. To make real use of polyploids the newest and best varieties must be treated in a number sufficient to cross polyploid with polyploid. The possibility for variation will be greatly increased. If we take *ab* and add *ab* we can get *aa, bb, ab,* and *ba.* But if we take *abab* and *abab* we can get *aaaa, bbbb, baaa, abaa* and *bbaa,* etc., to a score of variations. If we take *abcd* and add *abcd* we can get over 100 combinations. After crossing for a few generations great variety could be in the genes of both parent. At present polyploids are intertesting but the value lies in the hope of future development, which is most promising.

DURABILITY. 25 years ago some varieties hardly opened before 9:00 A. M. and were closed by 5:00 P. M. Now most varieties are good for nearly 24 hours. In cool fall days on the second crop some last nearly 36 hours or more. In another 5 years most new varieties should last 36 hours and before many years might last as well as roses, peonies and iris. They now resist wilting for 12 hours better than most flowers.

SEASON OF BLOOM. For years 'Judge Orr' and 'Blanche Hooker' have given each year two full crops. Others have repeated some. This year the second crop on 'Costette' and 'Capri' was more and better than the first. There was some second crop on about 20 varieties. Three bloomed 3 times this year,—'Buttercup Lane' (Sass), 'Wideyed' (Craig), 7220 (Taylor). With a start like this we should soon have continuous bloom on the same plants from spring until freezing in the fall.

QUANTITY. Some report 50 to 75 blooms to a scope. A graceful stem could hardly be expected to carry more. But most of those in my garden seldom or never reach the 50 class. It is hoped soon all the new ones will bloom like the most prolific at this time.

BRANCHING. Branching is not a great deal better than on an occasional old one like 'Semperflorens,' but is improving all the time. The average is much better than formerly. Within a few years all the new ones should be as well branched as our present best and some even better.

COLOR. Some of the new ones have nearly every color but blue and white. 'Mabel Fuller,' 'Powder Puff' and 'Fond Caress' are splendid nearly white varieties. There are some near whites that wilt or curl in the hottest sun. 'Pink Dream' and 'Blue Danube' have blue pigment, which should be segregated and increased in these and others until true blue are produced.

SIZE. From 'Mignon' to the largest there is a wonderful range. But we should get more good small ones. They are needed worse than medium and large.

SHAPE. There is a wide variety. Some are spiders. Some have petals so wide they overlap. Some are shaped like lilies, others open wide or curl back. Some have pointed or twisted petals. There should be some more different colors in each shape.

IN GENERAL. For 30 years there has been a steady improvement in hemerocallis. Like automobiles, the new models are so fine, it is hard to see how anything better can be produced. But for years we have seen new ones better than any before. The improvement in the past 5 years is so great most of the older ones are surpassed. There is nothing in the past to indicate we have reached the limit. More people are breeding daylilies than ever before. There is always a chance a lucky cross may be a success. Then we have a number of professional breeders who are planning for the future and working for introduction 5 or more generations from now. Each year they have better stock from which to breed. Try to keep your collection up to date. Get a few of the best of the 600 new ones introduced annually. When they bloom the following year, you will be grateful to the patient men and women who have planned and worked with skill and patience to give you something better than was ever available before.

[PLANT LIFE LIBRARY, continued from page 4.]

MECHANISMS OF MICROBIAL PATHOGENICITY, edited by J. W. Howie and A. J. O'Hea. Cambridge Univ. Press, 32 E. 57th St., New York 22, N. Y. 1955. pp. 333. Illus. $5.00. In this book the papers presented by sixteen authorities at the 5th symposium of the Society for General Microbiology are brought under one cover. The object of the symposium is to focus attention on the processes and mechanisms whereby infecting organisms produce disturbances of function or metabolism, toxemia, visible lesions and death of the host organism. This stimulating book is indispensable to all who are interested in microbiology, physiology and pathology.

THE CHEMISTRY AND FERTILITY OF SEA WATERS, by H. W. Harvey. Cambridge Univ. Press, 32 E. 57th St., New York 22, N. Y. 1955. pp. 224. Illus. $5.50. The author summarizes recent investigations dealing with the salts and dissolved gases in sea water, the changes in composition brought about by plants, animals and bacteria, the mixing which takes place in the oceans, and the waters' physical properties. This important book is highly recommended.

BRITISH MOSSES AND LIVERWORTS, by E. V. Watson. Cambridge Univ. Press, 32 E. 57th St., New York 22, N. Y. 1955. pp. 419. Illus. $8.50. This charming book was written for the beginner in bryology, and also as a reference book for the more advanced student. Non-technical descriptions are given of 154 species of mosses and 55 species of liverworts, and each of these selected species is illustrated. With the help of the keys and notes that are given on additional species, it should be possible to identify 310 species of mosses and 136 species of liverworts. This stimulating book is highly recommended.

4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

MY AMARYLLIDS

Reg. F. Harradine,
102 Byng Drive, Middlesex, England

Some five years ago I received from Holland a bulb list in which were described and illustrated, some *Amaryllis,* in scarlet, orange and white. They were new to me, but they looked so attractive and the culture instructions given presented no great difficulty, so, I ordered a few. In due course the bulbs arrived, were potted up, and, in a surprisingly short time, flowered.

I do not think I shall ever forget the thrill of those first *Amaryllis* flowers. Their size, beauty of form and brilliant colour, fascinated me. I wished for more of them and this desire was intensified by what I read about them in Macself's 'The Amateur's Greenhouse' and Sander's Encyclopaedia.

Letters to many nurseries and bulb growers in England brought no results, but fortunately I noticed an advertisement by Ralph Cusack of Roundwood, Ireland, mentioning rare Amaryllids etc. I soon received his catalogue. What a list! What descriptions! I suppose only an Irishman could find such variety of superlatives and adjectives. An almost fanatical love for the wildlings and a supreme contempt for what he described as the 'overcultivated, overfed, overcivilised garden types'. His sorrow at having to close down his nursery must have been very great indeed.

I had several things from him :—*Amaryllis aulica,* an evergreen sp. from Central Brazil, with long bright green leaves, producing its first pair of flowers in December. Deep red, narrow tepals, four to five inches in length, bright green throat. In the sunlight the flower glistens like *Nerine sarniensis.* A second bud appears about the time the first flowers begin to fade. I find this one of the easiest of the sp. *Rhodophiala bifida,* an Argentinian miniature of which I had three bulbs. One only has survived and this has taken a long time to get going. Now it is growing strongly and will surely flower in due time. *R. bifida var. spathacea.* Came to me as *Habranthus roseus,* but, flowering in September, proved its true identity. An umbel of four small, perfect flowers, mauvish pink, the tepals being about 1½ inches in length. The flowers are held a little above horizontal. One notable feature is the splitting of the spathe on one side only. *Amaryllis striata.* A dwarf from southern Brazil which I find grows best if given some shade. A very good plant, some twelve inches in height, giving two stems, each bearing four scarlet, green throated and starred flowers, some three to four inches in length.

Amaryllis reticulata striatifolia. Another from south Brazil, with very beautiful four inch flowers, mauvish pink, finely netted with deep red veins. The leaves attain a length of about nine inches and are broader in the middle than at the base. A well defined white line along the middle of the leaf makes this plant decorative even when not in flower. I find it evergreen and summer flowering. *Rhodophiala* advena, a Chilean narrow leafed sp. which so far has refused to flower. I believe this one does take a long time to establish. *Habranthus brachyandrus* from Paraguay. A lovely plant which never fails to favour me with flowers. Fifteen inch stems bearing upstanding 2½ inch lavender rose, trumpet shaped flowers, with dark purple blotch at base of petals. Successfully pollinated this with Zephyranthes grandiflora this year. *Habranthus robustus* from Argentina. Pale rose pink trumpet flowers with greenish throat. Very nice. *Elisena longipetala,* from Peru. What an exquisite flower. A 'super' *Hymenocallis,* with longer, more twisted, spidery petals of pure glistening white. A really beautiful plant. *Crinum Moorei album var. schmidtii.* A very fine, vigorous, pure white form. The flower lasts a long time, especially if kept shaded and cool. I have it in bloom now (October). 4½ inch tepals, 4 inch tube, ¾ inch ovary and 2 inch pedicel. *Crinum powellii.* Too well known to need description. Does well here, blooming profusely. *Crinum erubescens* from Tropical America. High temperature essential to get it to flower. White and purplish pink and long tubed. Takes up a lot of room by reason of its very long leaves. *Clivia miniata,* from Natal. Is it possible to find another plant which asks so little yet gives so much. Lovely dark green strap like leaves and large umbels of orange-apricot coloured flowers in February/March. I grant a superiority to some of the hybrids, but— it is a lovely plant. *Haemanthus albiflos.* In flower now (Oct.). I think it more remarkable for its leaves than its flower. Dark green leaves attaining a length of 15 to 18 inches and a breadth of five inches or so, the edges of which have fine hairs. As the new leaves grow uprightly from the centre of the bulb, the older leaves arch over, eventually becoming streaked with yellow before finally dying off. The flower springs from between the old and new leaves on one side of the plant. A tight umbel of pure white flowers from which extend the deep yellow anthers. The flowers remain tightly enclosed by the greyish white spathe, which makes the flower interesting but, I think, unattractive. *Haemanthus coccineus.* This large bulb keeps producing its great leaves and gets progressively larger, but stubbornly refuses to flower. *Lycoris aurea.* Like a golden *Nerine.* *Lycoris incarnata,* salmon pink veined blue. *Lycoris radiata,* brilliant scarlet. *Lycoris squamigera,* lovely shade of pink lightly veined blue. These *Lycoris,* although so similar to Nerines, are certainly more difficult, that is, here in England. The text books say lift in the autumn and store dry or repot annually. I am sure they resent this treatment and prefer to be left undisturbed like other Amaryllids. They need warmth but dislike heat. They want moisture when in growth but must be kept dry when resting. I find it best to treat them like hybrid *Amaryllis* but with a much earlier resting period.

They seem to like this, no matter what the books say! *Pancratium illyricum,* I have not found the correct culture for this. *Pancratium maritimum,* easier and growing well, but being a young bulb, will not flower for a year or two. *Zephyranthes candida.* In flower now (Oct). Their dainty, white, upturned crocus like flowers, with rich golden anthers, I find particularly attractive. Also in flower now is *Zephyranthes grandiflora.* A much larger, carmine striped rose pink bloom, also possessing large golden anthers. Very lovely.

All the above were obtained from Ralph Cusack. Then he wrote saying he could carry on no longer because of bad health and inability to obtain essential labour. This was a blow, for by now I had really been bitten by the 'collector's bug'. It seemed a shame that such a wonderful collection of wild plants should be broken up. From my own experiences I can now realise the enormous amount of time and effort which must have been expended in building it up. I always try to bear in mind one piece of advice R. C. gave—'Damp, soaking damp, is the bulb's worst enemy: but above all, stagnant damp. It is essential to bear in mind, always, one supreme watchword—DRAINAGE.' How true!

Now, all magazine advertisements were carefully studied for clues to any possible source of supply, but, presumably because these plants are primarily greenhouse subjects in this country, references to Amaryllids seldom appeared. From P. M. Vandertang of Guernsey I was able to get *Nerine sarniensis,* that lovely, glistening, brilliant red 'Guernsey Lily' and its orange scarlet variety *corusca major,* both of which are now in bud. *Nerine flexuosa,* a lovely pink, and its pure white counterpart *alba.* Both lovely and free flowering. *Nerine undulata* Early flowering with rose pink flowers, the petals of which are nicely waved. *Nerine filifolia,* a smaller edition of undulata, very dainty flowers of long stems arising from tufts of grass-like leaves. *Nerine* 'Pink Triumph' a very fine pink hybrid. *Brunsvigia rosea,* (still listed here as ''Amaryllis belladonna'')—I have them in pots, three bulbs to a 12 inch pot, in the coolhouse, and they do very well. They have just finished a grand display. It is said that potted bulbs do not flower freely, but I get a good show each year. I leave them undisturbed excepting for renewing the top inch or two of soil after flowering, and keep always moist, never drying out. *Hymenocallis narcissiflora* 'Advance'—almost as beautiful as *Elisena.*

This nursery kindly gave me names of people in France, South Africa and Australia from whom they thought I might be able to get other species. From Vilmorin et Andrieux of Paris I received two varieties of *Amaryllis vittata,* both of perfect form and beautifully fragrant. One, white, spotted and striped rosy crimson. The other, creamy white, spotted and striped deep, dull brick red. The blooms are not over large, about four to five inches, but they are beautiful. Undoubtedly hybrids, but close indeed to the description of the true sp.

The Australian nursery had nothing but suggested I write to the Botanical Gardens, Singapore. This I did, and in due course the

Director very kindly sent me a parcel containing *Amaryllis belladonna* L. *(equestris), Zephyranthes cardinalis, Z. citrina, Crinum asiaticum, C. amabile* and *Eucharis grandiflora.* All have established well and I think I shall have flowers from some this coming season. *Eucharis* has already flowered. A lovely thing, and what fragrance. The Crinums are massive.

From Mrs. Richfield of Bloem Erf Nurseries, Stellenbosch, C. P. not only have I received many bulbs but also some very nice letters. I now know a lot more about South Africa than I did two years ago.

From this source I received *Crinum bulbispermum,* the well known Cape Crinum. *Cyrtanthus mackenii,* in varieties white, cream, apricot and pink. Dainty things, with drooping, long, tubular flowers held in an umbel. *Cyrtanthus o'brienii,* very similar to *C. mackenii* but bright red flowers. *Cyrtanthus obliquus* and *Cyrtanthus carneus,* these two spp. have only arrived during the last few weeks. They are, I believe, rather rare. *Brunsvigia sp.* un-named from Natal, recently received. *Buphane disticha,* a fan of blue green leaves, held tightly at the base, in the neck of the bulb, makes this quite ornamental in foliage. I hope soon to receive the other sp. of this genus, *ciliaris.* From what I have learned of these plants, they would seem difficult to flower. Apparently, in their native habitat it takes a veldt fire to make them flower. Seems I shall have to put a pile of sticks over them and simulate a scrub fire! *Cyanella capensis.* Who would think this an Amaryllid? The tiniest of flowers, in sprays, on stems springing from the centre of two or three small, tulip-like leaves. In flower a very long time. Charming plant. *Hypoxis stellata* var. *elegans.* Another small Cape member, with leaves similar to Cyanella, but bearing on a three inch stem, a large star like flower, with white pointed petals with black centre. Prior to flowering must be kept dry. Very pretty. *Haemanthus Katherinae.* I need the eloquence of Ralph Cusack to describe this beauty! I have seen it described as Nature's most spectacular flower. I think it must be. A hundred or more dazzling orange scarlet flowers forming a 'ball' some nine or ten inches in diameter, carried on a twelve inch stem. A glorious flower. *Haemanthus natalensis,* grows like *H. Katherinae,* but cannot equal it, although it is a lovely brilliant red bloom. *Haemanthus puniceus* is a little different to the others, the flower, which is bright vermilion red, appears with the leaves. The latter are much taller than the flower. It is a handsome plant. *Haemanthus magnificus,* only recently received. *Vallota speciosa,* another very well known Cape Amaryllid. Not unlike *Amaryllis striata,* but flowers held more erect and the tepals are more rounded. Rich red. Does not like to be kept too damp. Good drainage absolutely essential.

Through the kindness of a well known English Lily nursery—Messrs. R. Wallace of Tunbridge Wells, I was able to get a few bulbs from Van Tubergen. *Amaryllis* x *acramanii,* an early hybrid *(aulica platypetala* x *psittacina)* which, according to Nehrling was raised in 1835. Large, well opened flowers, scarlet with a white stripe, and a deep green and white throat. A lovely flower. This morning (Oct 15) I was delighted to notice the tip of a bud just appearing. Hybrid *Zephyranthes (Cooperanthes hortensis),* my only one so far. This one has large expanded pale pink flowers of good substance, and is lovely. I hope I shall be able to get more in due course. There are many in the States, but the regulations imposed by our Ministry of Agriculture make it almost impossible to obtain them. *Crinodonna corsii (Amarcrinum howardii)* has been in flower some three weeks and still looks lovely. Large umbel of flowers of a really beautiful shade of deep pink, on a very strong stem. This is certainly a fine plant. *Crinum krelagei.* Also in flower (third stem this year). Light rose pink, reflexed flowers. Very nice. *Haemanthus multiflorus.* I have praised *H. Katherinae.* I could almost say the same of this one, almost; Not quite so startlingly beautiful, but—a lovely thing. A ball of interwoven carmine red petals. *Hymenocallis speciosa.* This nearly succumbed to bulb mite, but drastic treatment of the 'kill or cure' kind has cured it and it is now growing well. *Hymenocallis amancaes,* similar in growth to *Elisena,* but smaller and has brilliant yellow flowers. *Hymenocallis* x *festalis,* a hybrid between *Hymenocallis narcissiflora and Elisena.* White flowers with curving spidery petals. This branch of the Amaryllids has, I think, an almost ethereal beauty. They are all exquisite. *Sprekelia formosissima.* This has a real fascination for me. I have several in flower now. It is seldom I cut flowers to bring into the house, but I cannot resist bringing in some of these. Brought in as buds, they open to perfection and last well in a cool position. The precise manner in which it holds its petals, the somewhat unique shade of deep crimson showing up the deep golden colour of the anthers. A wonderful flower.

About this time I noticed in 'Gardening Illustrated' a letter from an American lady asking for English plant lists, to which I replied asking in my letter if she could give me the address of the AMERICAN AMARYLLIS SOCIETY, mention of which I had found in an American book—'Garden flowers in Colour' by Foley. This led to my becoming a subscriber to the A. P. L. S., receiving in due course a copy of HERBERTIA and Drs. Traub and Moldenke's "Amaryllidaceae". The 'Amaryllid fever' from which I was now suffering immediately took a turn for the worse, and I am afraid, although more than a year has elapsed since I received those books, there is no sign of it decreasing in intensity! I rather think I am now a chronic case! Well, further correspondence with this lady brought me an introduction to Mr. L. S. Hannibal. There cannot be much that I can say of 'L. S. H.' that Amaryllis enthusiasts do not already know. I have had the pleasure of several letters from him and much advice and information. Following up suggested sources of supply has led to my having correspondents in many far away places. Mr. Len Woelfle, with typical American generosity collected together a grand lot of bulbs to send to me, but found himself up against the regulations already mentioned ,and found he could do nothing and the bulbs had to be returned to the soil. The regulations become, in effect, an embargo.

From David Chandler, Victoria, Australia, I have had several fine bulbs and many grand letters. I am sad to say he died suddenly on the 23rd August. We had, through the medium of our letters, become real friends. I shall miss his letters very much. *Amaryllis* x *johnsonii,* the earliest hybrid, so well known to devotees in the States as to make any description from me quite unnecessary. It has grown well with me and has already given a good display of flowers. I would say it can still compare with a good many of the modern hybrids. *Rhodophiala pratensis* a Chilean sp. of *Habranthus* style. Twelve inch stem carrying slightly elevated 2½ inch flowers, variable in colour, reddish violet to purple. *Anigozanthos.* I have some 200 seedlings, almost a year old now and doing well, of the three sp. *flavida, rubra* and *manglesii.* I have never seen these plants, nor any illustration of them. In Australia they are regarded as weeds. I await the flowers with some anticipation. *Brunsvigia gigantea.* Growing strongly and should flower next season. *Brunsvigia hybrids* (hybrids between the Cape Belladonna, *Brunsvigia rosea* and other *Brunsvigia* species.) David Chandler did a considerable amount of hybridising with these plants, of which he was very fond. He sent me eight of what he thought were his best, including a semidouble. they are all growing nicely and I hope will favour me with bloom next season. I have no details of parentage. The leaves and manner of growth show much variation. *Bravoa geminiflora,* the Mexican Twin-flower, has not flowered this year. *Calostemma purpureum.* Have several bulbs, all slightly different in colour. I understand this variation is natural. *Calostemma lutea,* received a few weeks ago, now in growth. I hope to receive *C. alba* very soon. It is being collected from the Magnetic Isles north of Queensland. These plants have daffodil-like flowers on tall stems, some being bicoloured. *Clivia nobilis,* traveled all the way from Australia quite safely and is going well. *Eurycles cunninghamii,* still dormant. *Hymenocallis littoralis* and *H. macleana,* have settled down nicely and growing well. *Urceolina pendula.* Twelve inch stems carrying drooping tubular flowers, bright yellow. Pretty.

Through the kindness of a friend in Rio de Janeiro I received a collection of eight hybrid amaryllis, the *'Colecao Paulista'* of Dierberger of Sao Paulo. They are very nice. 'Taubate' a rose pink keeled white, green throat. 'Ribeirao Preto' a creamy white, pale amber green in throat, tepals lightly striped crimson. 'Campinas', light brick red, keeled white with amber green throat. 'Sao Paulo' White, the three upper tepals widely keeled with purplish mauve, lower tepals very lightly coloured. Greenish throat. 'Santos' Bright red self. 'Bauru' Reddish orange, dark in throat, fine amber white stripe along keel of tepal from throat to point. 'Piracicaba' White, with touches of amber, keeled white, striped to the outer edges in purplish mauve, greenish throat. 'Sorocaba' Orange red self, deeper in throat. All eight varieties have well opened flowers, all are very attractive. They bloomed 'on the bulb' soon after I received them, but during the year have made good foliage and the bulbs seem to have recovered and increased in size. I think most of them will again bloom in the early part of next year. From Dierberger I have just received a further collection of hybrid Amaryllis, but these bulbs have only identity numbers, and no indication as to type or colour. Every bulb is already showing three buds! It is to be hoped they will get their root systems working without delay.

Dr. Vargas of Cuzco, Peru, earlier this year sent me a nice parcel of *Urceolina peruviana.* All the bulbs flowered. Like *U. pendula* with bright orange scarlet flowers, the golden anthers hanging well below the petals, tightly bunched. From five to nine flowers in the umbels. Also a parcel of an unidentified *Amaryllis* sp. Most of these flowered. I expected them to be *A. forgetii,* but excepting for the colour, which is dull crimson, all parts agree with the description given in 'Amaryllidaceae' for *Amaryllis moreliana.* At first sight it is not what I would call a very attractive flower. Heavily keeled deep green on the outside, with dull crimson to the edges, make it appear heavy especially as it tends to droop. But the inside of the flower is quite lovely. Bright green throat shading into white along the keel and extending each side, to form a beautiful six pointed star, which shows up brightly against the dull crimson. If the flowers were held more horizontally it would be really fine.

From Mr. Adrian Thompson of British Guiana I have had *Amaryllis stylosa.* I think this one of the loveliest flowers I have seen. The daintiness of its flesh red colour, the waved tepals, slender tube, perfect poise, beautiful creamy green throat—I think it a superb flower; something to gaze at in silence. *Hymenocallis ovata,* a lovely fragrance to this as well as a very attractive flower. *Crinum augustum, Crinum americanum* and *Crinum zeylanicum,* all in full growth and have yet to flower.

My latest aquisitions, all during the last few weeks, and all more or less dormant or settling down; from the Transvaal—*Crinum sp.* unnamed, a huge bulb. *Haemanthus amarylloides, Haemanthus nelsonii, Cyrtanthus sanguineus, Nerines bowdenii, filamentosa* and *masonorum.* From an English nursery, *Nerine spp. humilis, candida* and *thompsonii. Nerine hybrids* fothergilii *'Queen Mary', sarniensis 'Le May',* 'Rotherside', 'Lord Grenfell', and 'Rose Camellia'.

Finally, of my own efforts, I am looking forward to the Spring when I hope to have some 200 seedlings flower for the first time, of hybrid *Amaryllis.* I wonder, what will they be like?

That is the story of my Amaryllids so far. More will be reaching me soon, many, many more remain to be found. Seeking them has brought me into contact with some grand people, many of whom regularly correspond with me, and so, my life has been much enriched.

AN EAST INDIAN TREASURE: **EURYCLES SYLVESTRIS**

WYNDHAM HAYWARD, *Florida*

Another charming member of the Amaryllis family found in the far East is *Eurycles sylvestris,* Salisbury, a medium sized bulb, in growth and habit rather similar to the *Eucharis* species of the Western World.

As may be glimpsed in the accompanying illustration (Fig. 21) the species has handsome spikes of star-like white flowers, about a foot tall, and rounded, strongly nerved bright green leaves which are even more striking and beautiful than the blooms. The bulb is rather ovate, about as large as a good-sized *Eucharis grandiflora* bulb (1½-2 inches diameter), and requires much the same treatment, considerable shade, good drainage, and rich, humusy compost.

It was named *Pancratium amboinense* by the good Dr. Linnaeus, but neither of the appellations stuck, as it was proved to be no kind of a *Pancratium,* and Salisbury's species name of *sylvestris* was retained over the Linnaean *amboinensis* for some reason we are not now prepared to explain.

This appealing plant is far too rare in Western horticulture. It has arrived in the Hawaiian islands and is grown in numbers of gardens there; is mentioned in Kuck and Tongg's "The Tropical Garden" (Macmillan) as "Japanese or Brisbane Lily", bearing "stalks of white scentless flowers, rising from the clumps of heart-shaped leaves". The culture may be found to be more like that of the Ismene group of *Hymenocallis,* as plants in pots in the writer's garden at Winter Park lost their leaves and went dormant in the winter of 1954-55 for several months. However this may have been due to several sharp frosts.

It has been kicking around in Eastern horticulture and the literature for centuries, and was described by Rumphius, the famous Dutch botanist of Amboyna as "Cepa Sylvestris" (wild onion). Commelinus listed it under his "Narcissus", earlier in the 17th century. As a *Pancratium* it was described and illustrated by Ker in the early issues of the Botanical Magazine (Plate 1419.)

"It is a stove plant, requiring rest in winter," said Dean William Herbert, writing about it in his "Amaryllidaceae", 1837. He adds that it is "liable to rot if wet gets into the neck of the root (bulb)." He reports the plant is close to *Calostemma* botanically, and of the co-species *Eurycles cunninghamii,* says it inhabits the same vicinity as *Calostemma,* which is Australia. On the other hand, E. sylvestris ranges from Malay through the East Indies to the Philippines and Australia. *E. cunninghamii* is a smaller form.

When not in bloom, *E. sylvestris* is even more good-looking than *Eucharis,* when the foliage is advanced to optimum extent. It will attract more attention than most Amaryllids in bloom or out in a choice collection. Three bulbs will do nicely in a seven-inch pot or pan or gallon can. Drainage must be very good, and in Florida the giant lubber grasshoppers (up to 3 inches long) are excessively fond of the tender leaves in summer.

Bulbs can be obtained from Hawaii with no difficulty, and from India at a lower price with much difficulty. They are a worthwhile addition to the Amaryllis repertory of American tropical bulb fanciers and might conceivably become a staple in the bulb trade some time when the problems of cultural requirements and propagation are worked out. The writer has never seen seed form in Florida, and offsets are comparatively slow, the same as in *Eucharis*. Another modern reference to it may be found in Neal's "In Gardens of Hawaii," the outstanding book of island horticulture.

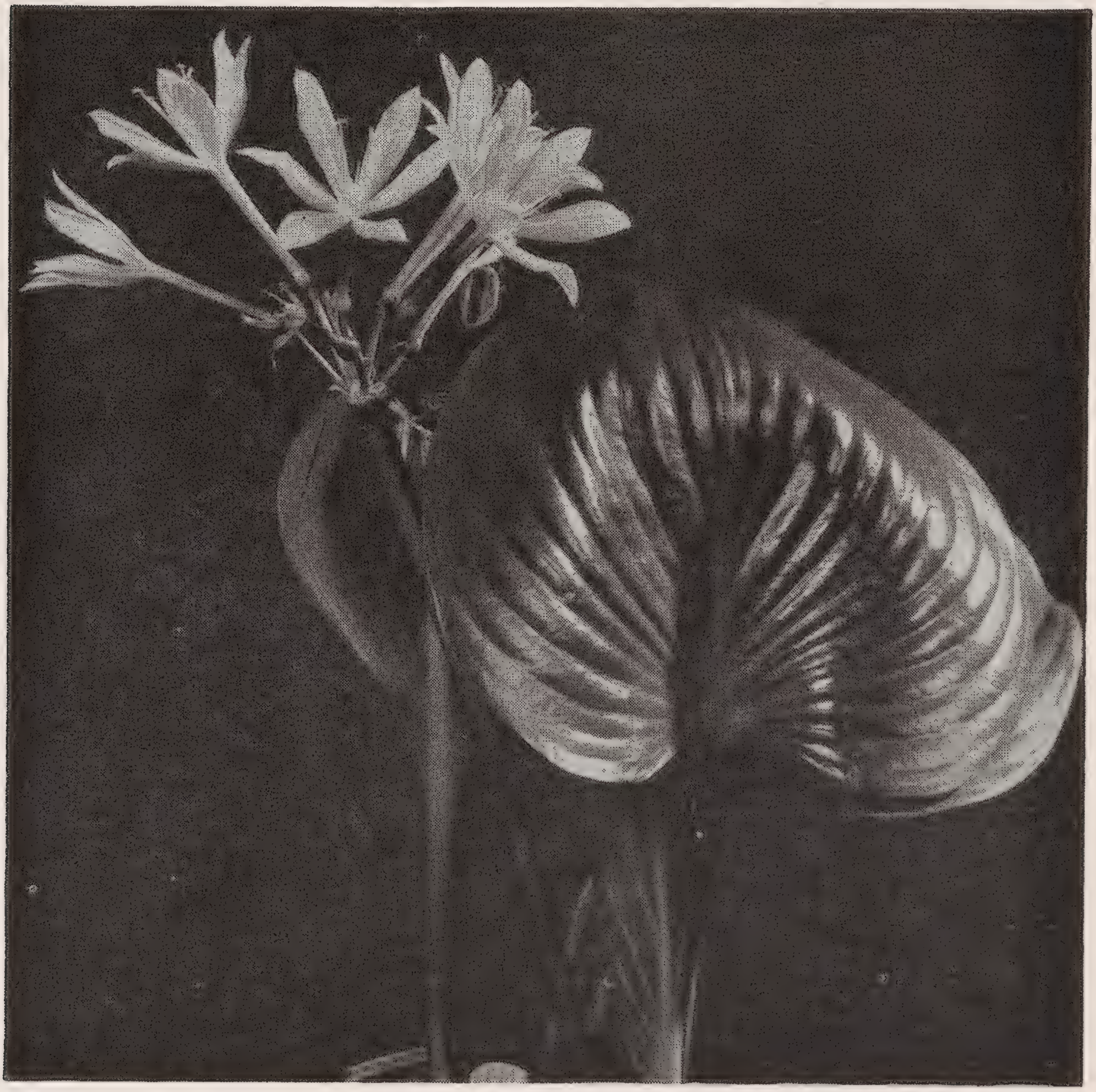

Fig. 21. East Indian Chalice Lily, *Eurycles sylvestris*. Photo—Lowe.

AMARYLLIS CULTURE AT DOWNEY, CALIFORNIA

J. F. STEWART, *California*

I feel most fortunate in having the opportunity to write these notes for the Annual, and wonder that more of the members do not take advantage of it. I know that I enjoy reading about the experiences of others, and that a large part of what I know about *Amaryllis* culture has come from articles published in HERBERTIA. Perhaps some reader will pick up a pointer or two from my experiences, and, who knows, some other potential gardener may be started on his merry way.

The 1954-1955 season has been a grand year in most every way for our hybrid *Amaryllis.* There were no extremes of weather, and no serious insect or disease attacks. The weed crop was also outstanding. As I get older, the weeds get tougher.

We had a great profusion of blooms outdoors, many thousands, most all of which were beautiful—only a few bulbs were destroyed because of not measuring up to our idea of desirability.

We gave away many dozens of bouquets, which aroused most enthusiastic interest. A noteworthy sidelight on this is that most of the inquiries received were from men.

A few of our blooms were displayed at the Downey Women's Club's ''Spring Garden Festival''. There was no competition, but the display was well received. So many people are not familiar with the hybrid Amaryllis flowers and are amazed when they first see them.

A few hundred of the bulbs dug last fall, of a mixed stock, both as to color and parentage, were not re-planted at the usual time, but were stored in drawers in the dark end of the garage, with the drawers left open for ventilation. Some that bloomed in storage were discarded, but the balance were planted outdoors this summer at various times, and under varying conditions, for experimental purposes. Part were stripped to the clean bulb, roots removed, and treated with mercuric chloride, part were treated with formaldehyde before planting, and part were planted as they were, in March and April. On Decoration Day, 24 were planted without any treatment. Of these, two were in bloom on June 29 and six on July 4, with 2 and 4 very good blooms per 18-inch scape. Of 24 planted July 4, six were in bloom by Aug. 18, with flowers which were a little below par. The balance were planted Aug. 1, and none of these have bloomed. These last ones were rather badly depleted, were down to about two and a quarter inches in diameter, and were obviously losing vitality. With the exception of 5 or 6, every bulb in all of the foregoing experiments is now, late October, growing nicely and making a good, healthy, strong plant.

The conclusion from all this seems to be that the bulbs have quite a long shelf life and are difficult to discourage, but that the best flowers come from early plantings. The loss of roots before planting, *under our conditions,* seems to have little, if any, effect on the vitality of the bulb. I have checked hundreds of bulbs that have been planted with the usual cropped roots, and have found that in almost all cases the old roots die and a new root system develops. When our bulbs are dug in the fall and we intend to replant them ourselves, the roots are cut off close to the bulb to help prevent air pockets. *When bulbs are transplanted during the blooming season all possible roots are retained.* We do this transplanting either to move the bulbs to rows of separate colors, or to pot up for breeding stock. There seems to be little, if any, set-back if care is used.

The glass house stock also did well this year. There is one outstanding salmon that had 9¾-inch blooms this year, and almost perfect flowers. I am proud of this one. It is being propagated and will be named. We measure our flowers diagonally across from the lower left to the upper right tepalseg, or vice versa, and without touching the flower.

Some bulbs were purchased from Holland, but they arrived late and only part of them bloomed, some with no scapes and quite off-type flowers. They were large bulbs, had some fungus and some were slow rooting. *Finally got them going with a lot of bottom heat.* There seems to have been some substitution here, since some of the flowers were not even close to the catalog description.

The results of my experiments in treating fungus with formaldehyde and mercuric chloride were not conclusive. It seems, from these limited experiments, that any concentration of formaldehyde that will kill the fungus is detrimental to this type of succulent-rooted bulb. Mercuric chloride seems to offer possibilities. Some of the bulbs treated with this were quite badly set back, but are making a good recovery. More work is needed to establish the value of the material and the most effective dilution. *Mercuric chloride should be handled with great care and only by those acquainted with its dangerous nature.*

I have been using a spray containing copper, put out by a local firm, which seems to show some good results, and plan to continue with this for the present. Any bordeaux mixture should have similar effects. I have been trying to obtain a copper-lime dust, but to date have found no commercial source.

The Kildeers, our favorite birds, raised their brood on the place, as usual this year, but had a bad time of it. They had four eggs, in their nest out in the amaryllis garden, which were about half developed when the crows got them. They then started another nest up closer to the house, and had two eggs laid when the crows got those. The third nest was started in a neighbor's garden, and this time they made it. Came home with three young ones. They run, and hunt food immediately after hatching, but do not fly for several weeks. Cute little rascals, and they become almost tame. One got killed somehow, we found it in the back yard, but the other two have grown up and are not now distinguishable from the parents.

Mocking birds raised a family under the ventilating sash on the small glass house, and doves are raising a pair of young ones on the place now. Young doves seem to be the most helpless of all the birds here.

These are almost full grown and the parents are still feeding them.

My pal Jack, the 85 pound boxer, developed some serious malignancies and we had to have him put out of his misery. Part of me went with him. We don't have a dog now, but as time goes on we will some day find ourselves the owners of a new pup, I'm sure.

I have started to investigate the possibilities of a small Hybrid Amaryllis Show here in Downey, and wonder if any of the members within reach of Downey would be interested in helping to put one on.

The foregoing was all ready for typing when an extreme hot spell hit us in late August. The temperature rose to 110 degrees on one day and reached above 100 on each of about ten days. Most of the *Amaryllis* leaves wilted down, and were badly scorched. Heavy irrigation apparently saved the bulbs, although some of them may be set back a bit.

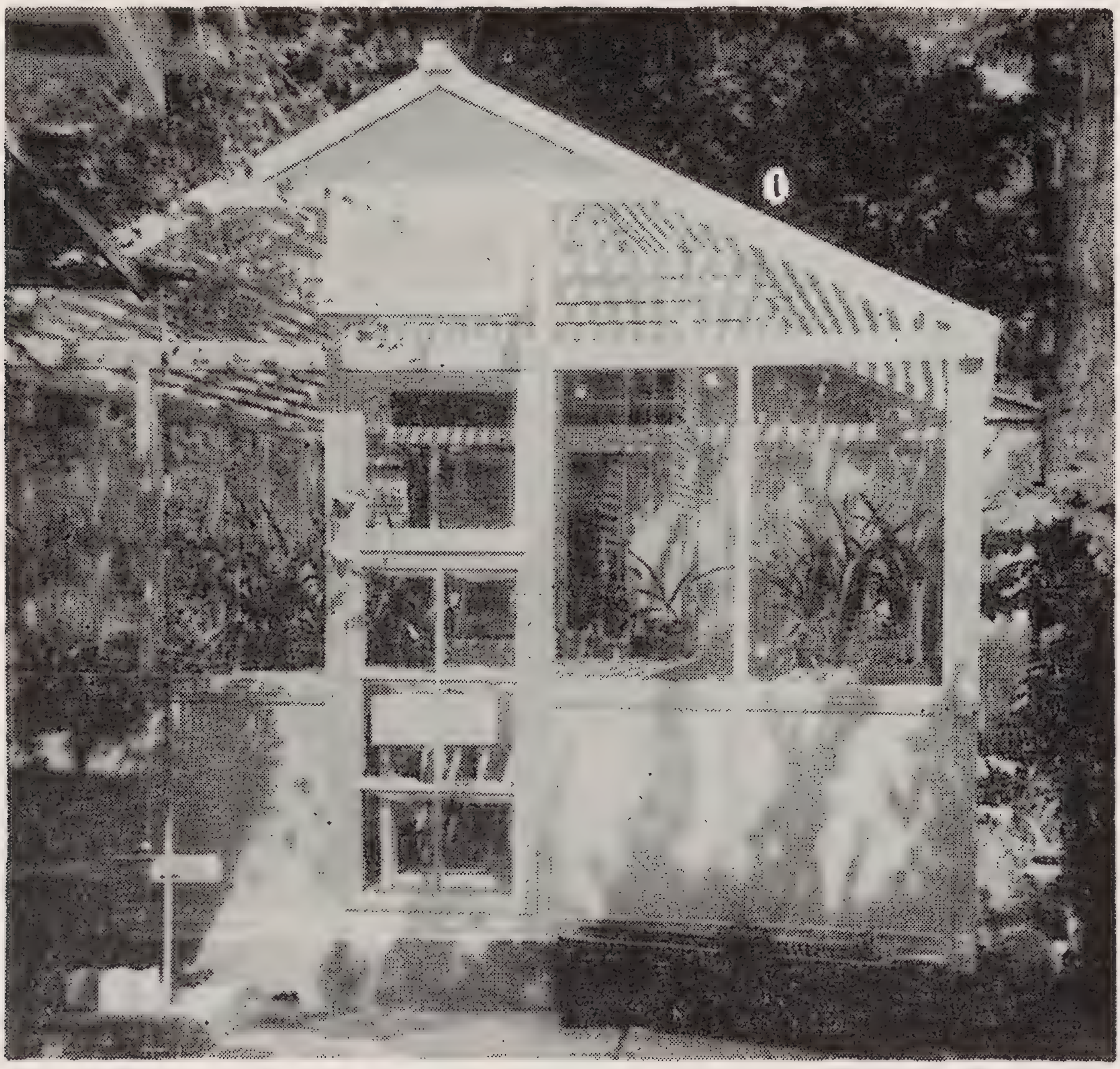

Fig. 22. La Forest Morton greenhouse, front view.

It was close. In addition to that near fiasco, there was a bad accident with the cuttings. I had been cutting up bulbs for about six weeks as I had time, and had two hot beds filled—about 4000 pieces. About a week after the last cuttings were set, the thermostat was found to have gotten out of order in some way, the temperature was way up and the cuttings were cooked—literally.

After checking all the flats, a few hundred cuttings were found to be in good enough condition for re-setting, but the balance are gone completely. I had to start cutting again, fortunately there was enough stock to practically fill the beds, but won't have so many of the good bulbs for blooms next year. All of which has made an enormous amount of extra work, and I haven't time to do anything about trying to work up interest in an Amaryllis Show. I was discouraged for a while, but there will be a lot of new bulbs blooming next year for which I have great hopes. Some of them will be blooming in less than five months now.

GROWING AMARYLLIS IN A GREENHOUSE

Mrs. W. D. Morton, Jr.

Is there an indoor gardener who has not sometime longed for a greenhouse, but looked on it as a luxury which only millionaires could afford? Modern material and manufacturing methods have made it possible to produce greenhouses in a low price range. Prefabricated models save a lot in construction cost. We had planned a greenhouse for several years. My hobby is Amaryllis, and last winter the weather was so changeable and bad that it marked the turning point. Luxury or no luxury, we had to have a greenhouse.

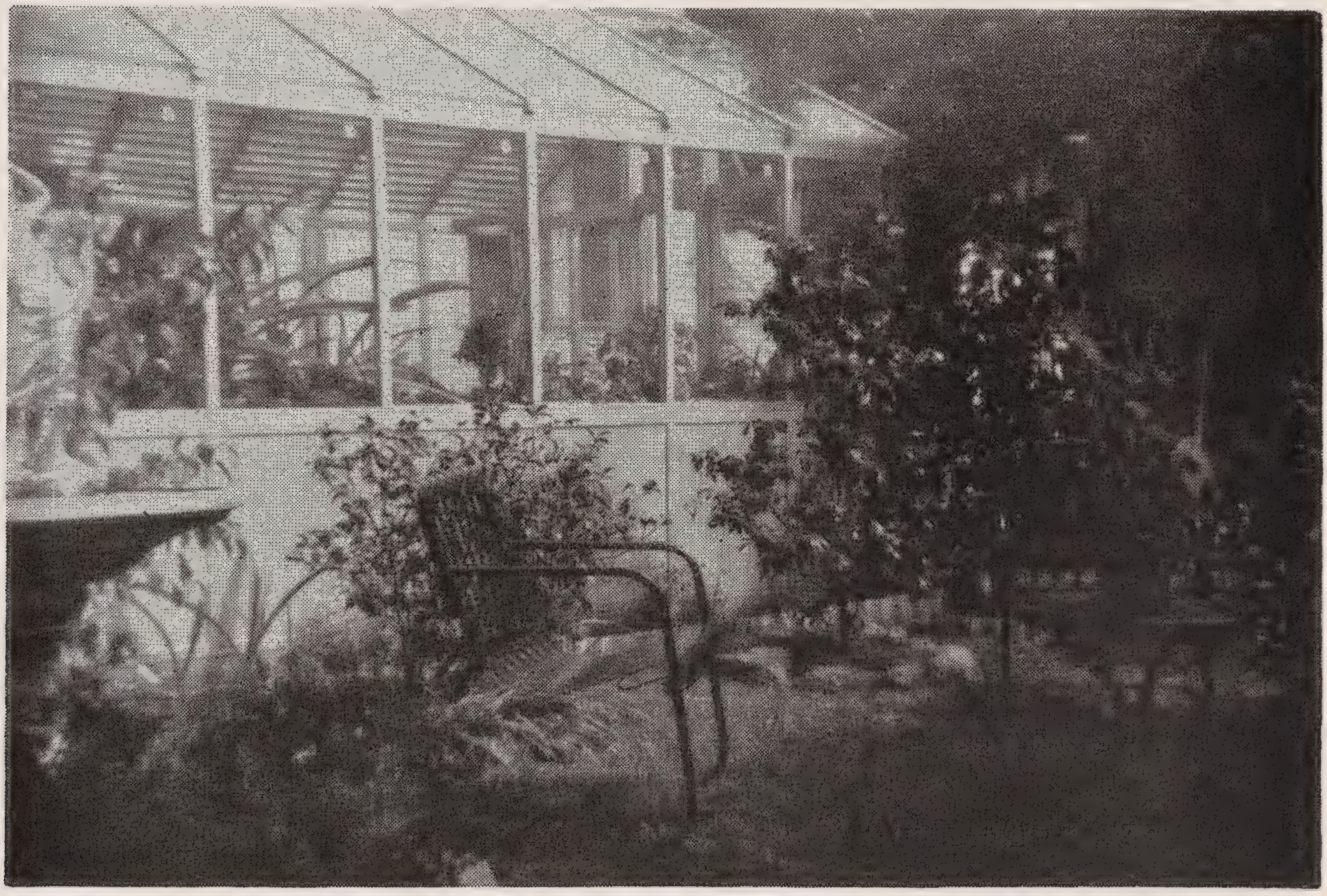

Fig. 23. La Forest Morton greenhouse, side view.

We chose one of the prefabricated models, and saved in construction cost, as you do not need skilled labor to do the work. My husband supervised all the construction and in a few week-ends we had a lovely greenhouse (Figs. 22 and 23).

The ventilation is perfect with a small window in both front and back at the top, and a larger window lower in the back, and a Dutch door. We have an electric fan to take out the excess heat in summer. We used laths to strip the top, which gives us 50-50 sun and shade. We have trees that shade the greenhouse the rest of the day.

We use a thermostatically controlled electric fan heater, to circulate the warm air. It is the most convenient, and practical way of heating, as we do not have much cold weather in the South. The heat is efficient and automatic. My husband is an Electric Engineer, and thus our lighting and heating is well done. We use fluorescent lighting for plants and seeds.

The doors and windows are screened to keep the bees and butterflies from pollinating. The benches are made of the best grade of cypress, and just the right height for comfortable working.

As I said above, my hobby is Amaryllis, and I am looking forward to Spring when my greenhouse will be an object of beauty. Am planning many experiments, and maybe later will tell you of my findings in ''Growing Amaryllis in the South in a Greenhouse.''

BRIEF SURVEY OF THE PANCRATIEAE

Len Woelfle, *Ohio*

This article is written partly in the hope of interesting other amateur and professional growers in the possibilities of further improving—what in my opinion is the most exotic and stately group of plants in the natural order of Amaryllidaceae—by hybridizing; partly in an effort to clarify some of the confusion now existing even among the more widely grown species and hybrids of *Hymenocallis;* and to pass on to those interested in these plants, my own personal observations of those that have come to my attention.

The list is far from complete, and many species have been omitted purposely, because their inclusion would rather have added to than helped to clarify the already existing confusion. There are of course many species yet to be introduced into cultivation and many which have been lost to cultivation. There are also many species and varieties under cultivation at present which defy positive identification because information in some of the older texts is sketchy or incomplete.

Nevertheless a number of species may be rather definitely identified and it is with these that this article shall deal.

CALOSTEMMA: This genus so far as is known, is limited in natural distribution entirely to Australia. It consists of two species presently under cultivation, one additional species definitely identified, and perhaps another on which information is very incomplete. Bulbs are rather small compared to some of the more robust growers in the Amaryllis family like Crinum, etc., being somewhat oval or sub-globose, the largest perhaps three inches long in the vertical diameter and an inch and a half to two inches in the horizontal diameter, in *C. purpureum.* Bulbs of *C. luteum* are slightly smaller and more globose. In pots *C. purpureum* will remain in slow growth the year around. *C.*

luteum seems to have a definite resting period in summer. Both species bloom freely in early fall and usually set ample seed with hand pollenation. *C. luteum* is fairly stable in characteristics, but according to Mr. David Chandler of Tecoma, Victoria, Australia, who has seen many of these plants in their native habitat, there is a great deal of variation in *C. purpureum,* which ranges in color from a rather muddy purple to lavender, pink, and even white.

There is at least one other species growing in Northern Australia, *C. album,* which differs from the more southern species in that it has wider foliage, showing an affinity to *Eurycles* another closely related genus growing in that region, and a pure white flower. Both *C. luteum* and *C. purpureum* have narrow, erect foliage up to 18″ long in well grown specimens. The flowers of these species resemble miniature daffodils with a slender obconical, bicolored staminal cup, greenish yellow with a reddish crown in *C. luteum,* and purplish below with a yellow crown in *C. purpureum.* Blooms are about two inches across in both species and the slender cup perhaps three quarters of an inch deep and barely a half inch in diameter at the opening, topped off with erect filaments about a half inch long, bearing oval anthers with bright yellow pollen. Flowers are somewhat drooping, carried on slender pedicels up to two inches long, on a scape which may stretch to thirty six inches long, sometimes angular below, but usually round and tapering. Both species may have one or two scapes of blooms. *C. purpureum* carries up to 35 blooms per scape, and *C. luteum* up to 15. *C. luteum* has a definite walnut-like fragrance.

The writer knows of no hybrids between the species of *Calostemma.* However since both *C. luteum* and *C. purpureum* bloom together and are morphologically very similar and seed freely possibilities of hybrids should be excellent. Mrs. John Schmidhauser, (née Thelma Ficker), informed the writer that both have 39 somatic chromosomes, $2n = 39$, indicating further their close genetic affinity.

EUCHARIS. There are a number of species in this genus, but apparently only one *E. grandiflora* (syn. *E. amazonica)* is available at this time commercially. The beautiful waxy white blooms are used extensively in corsage work and bridal bouquets and are grown commercially in some areas for this use.

Eucharis is not of the easiest culture, but given proper treatment and a congenial atmosphere, may be brought into bloom several times a year by alternate periods of rest and vigorous growth. They seem to require much water in growth, little while resting, and a warm, humid, partially shaded location. The blooms, usually four to an umbel are carried on round, green, tapering scapes about 16″ high. They have a delightful fragrance, and a texture rivaled only by some of the Aroids and the more distinguished of the Orchids. It makes an excellent house plant and although not one of the easiest, certainly worth the effort to grow it well. Foliage is petiolate, the oval dark green blade about three to five inches broad and twice as long.

Index Kewensis lists two hybrids, *E.* x *stevensi,* apparently an interspecific hybrid, and *Urceocharis* x *clibrani,* a bi-generic hybrid between *Eucharis* and *Urceolina.* Neither hybrid seems to be in cultivation today. According to Darlington's Chromosome Atlas of Cultivated Plants, *E. grandiflora* has 69 somatic chromosomes, $2n = 69$.

EURYCLES. This genus is little known in cultivation, with only two or perhaps three identified species, *E. cunninghami* from Australia, *E. sylvestris* from northern Australia, New Guinea and the Malay peninsula, and *E. nuda* from the East Indies. *E. cunninghami* is rather easy as a house plant, blooming early in spring with new growth. It has many white, perfectly formed Amaryllis-like flowers, of a delicious fragrance, about two and a half inches in diameter, carried on slender pedicels on round, tapering scapes some 16 to 18 inches in height. Foliage is dark green, petiolate. The blade of the leaf is oval about six inches broad and eight to nine inches long. Propagation is by the many seeds produced with hand pollenation, or by offsets from mature bulbs. The staminal corona is quite inconspicuous in the center of the bloom, barely exceeding the recurved tepals and is characterized by half-inch bifid teeth between the erect half-inch long filaments. Pollen is yellow, anthers oval. The plant is evergreen, but rests in winter.

E. sylvestris has foliage which is roundly cordate, usually broader than long. I have never seen the bloom of this species.

I know of no hybrids in the genus *Eurycles.* According to Mrs. Schmidhauser, *E. cunninghami* has 20 somatic chromosomes, $2n = 20$.

ELISENA: This is a small genus of strong growing bulbs from South America, closely related to Hymenocallis *(Ismene* section).

HYMENOCALLIS (ISMENE SECTION): Closely allied to *Elisena,* but characterized by larger cups and now considered a sub-genus of Hymenocallis.

HYMENOCALLIS: This is a rather large genus of bulbs, with many known species, most commonly referred to as CHALICE LILIES. Some are hardy, others nearly so, but for the most part sub-tropical or tropical in nature. They range in the United States from Virginia westward through Tennessee and Kentucky to Indiana and southward to Florida and Texas, through Mexico and Central America, northern South America, the islands of the Caribbean, with one outlying species from the west coast of Africa.

All have white flowers except *H. amancaes* (Ismene section) from Peru, with deep butter-yellow blooms and *H. undulata* from Venezuela with a red-tinged cup. Yellow also appears in the hybrids involving *H. amancaes* as one of the parents. All are very exotic plants and generally of easy culture, although a few are rather difficult, probably because of a lack of understanding of their requirements.

For cultural purposes they may be divided into four groups, with some over-lapping of cultural procedure between groups #2 and #3.

Group #1. Those requiring a definite dry resting period like *Elisena, Ismene, H. Harrisiana,* and several Mexican species characterized by having very heavy, globose bulbs. This group is generally deciduous.

Group #2. Those which may be kept in slow growth in pots over winter in the north, usually characterized by shiny strap-like foliage, and bulbs intermediate between those of groups #1 and #3. Usually evergreen.

Group #3. Those which will not stand drying off over winter and require some moisture the year around. These are the swamp-growing or water types usually characterized by leek-like bulbs, with green strap-shaped, shiny, foliage. Also those Hymenocallis from the Caribbean area and northern South America which usually have broad, or oval to nearly round foliage.

Group #4. Those which are hardy or nearly so in the north and should be left in the open soil to become properly established, as they resent disturbance. At the present time there are two species collected in Texas and the central south United States. One has somewhat erect, glaucous foliage which disappears in summer before the blooming period. The other has narrower, green, strap like foliage and blooms in spring about the time the seventh leaf makes its appearance. They may be other variants, differing somewhat from this description, but they would no doubt be found in nature in upland locations, or what might be termed "second bottom-lands." The glaucous-leaved type may be found in Texas, Oklahoma, Louisiana and Tennessee. The other may be found in the same area but with a range westward from Virginia to Missouri.

Before going on with the listing of the bulbs in the various groups established above I would like to add a few words of caution and advice to the beginner who wishes to procure some of these bulbs and to try his hand with them. With bulbs, one must remember that all that the nursery can guarantee is healthy stock. They can tell you how they grow them, but cannot insure your success with them. Tilth of soil, alkalinity or acidity, moisture or its absence, temperature or shade may all have a great deal to do with your ultimate success or lack of it, and all these conditions will vary from one locale to another. All plants are wild flowers somewhere and will grow as readily there as weeds, but they cannot adapt to all conditions. In nature they are usually confined to a definite area. How nearly we can simulate the conditions of their native habitat will be the deciding factor as to our success with them.

Hybridizing speeds up the evolutionary process of the plants, mixes characteristics, and generally makes a plant more versatile or adaptable, bringing about in a few short years, changes which might in nature take eons of time. Remember in nature plants don't have far to go, unless they are carried, and do not require a great deal of change. Therefore the species are rather stable.

We can help ourselves by purchasing our bulbs from reputable dealers or collectors who make an effort to classify their bulbs properly. They will do their best. The rest is up to you.

CULTURE OF HYMENOCALLIS SPECIES AND HYBRIDS

Group #1. Hymenocallis longipetala (syn. *Elisena longipetala), H. harrisiana,* the Ismene group, *H. amancaes, H. macleana* (syn. *H. pedunculata), H. narcissiflora* (syn. *H. calathina),* and the hybrids 'Advance', 'Festalis', 'Olympia' and 'Sulphur Queen', may all be planted directly in the garden here in the north, in a well-drained, sunny position when the soil warms up about mid-May, in a soil which would support a variety of vegetables. They require about five months of active growth from May to October. Planted in May they will bloom in June and July. They may be dug in early October and the bulbs stored warm and dry over winter at a temperature above 55 degrees and nearer 70 degrees if possible. The buds formed earlier develop further during this dry period and if the bulbs grew well the previous summer they should be fairly sure to bloom. Offsets should be left attached to the mother bulb until just prior to planting time in spring. This prevents further development of offsets and a relative weakening of the mother bulb. In some parts of southern California they may be left in the garden over winter, but they definitely resent dampness and cold when at rest. Some people say they are gross feeders. I have not found this to be true. Perhaps my soil has enough of the vital elements needed for good growth and bloom.

Group #2. Some of our native *Hymenocallis* like *H. tenuiflora,* having shiny green strap-like foliage may be stored dry like the Ismenes over winter, or kept in slow growth in pots. In some cases where the bulbs dry too severely they may not recover so they should be examined periodically until such time as it is determined just which ones will stand drying over winter. Bear in mind that many of these plants are basically swamp plants. At Ohio State University in Columbus, Ohio, several species are grown in pots partially submerged in tanks of water.

Group #3. All living plants seem to have a definite resting period when little or no growth is made. When active growth stops, watering should be lessened until the plant shows signs of renewed growth. Usually bulbous plants will bloom after this rest period when new growth begins but there are exceptions to the rule, like the liliums which bloom on current growth. *Calostemma* rests in spring and summer and blooms in fall with new growth. *Eucharis grandiflora* may be made to bloom several times a year with alternate period of rest and growth. To force bloom water must be given sparingly during the resting period. Some of the broad-leafed evergreen *Hymenocallis* from the Caribbean Islands and South America bloom in September and grow vigorously for several months in early fall and winter, going into a period of semi-rest over spring and summer. Others may bloom with new growth in the spring. A knowledge of the plant's habits should be obtained whenever possible. Otherwise you would do better to try the easier kinds about which culture is fairly well established until sufficient horticultural progress is acquired to determine a plant's needs by observation.

Group #4. With the hardier species of *Hymenocallis,* little is known of their needs at this time. The bulbs with green foliage seem more readily adaptable to culture and will grow under varying conditions. This type is usually found near, but not growing in water. The glaucous leaved type seems to be definitely an upland plant. Yet it will not grow in extremely dry locations. Apparently it grows only a short time in the spring and early summer. By August it is usually dormant. Bloom comes in late summer most unexpectedly with one or more rains. Northern limits of hardiness for these two types have not been definitely determined, but both seem fully hardy here at Cincinnati without protection. Both types are known in various places by the common denominator of ''*H. occidentalis*''. The glaucous one seems also to be the same as *H. eulae.* The type with green foliage is also known variously as *H. galvestonensis* and *H. liriosme.* The type with the green foliage definitely seems to be the easier of the two to adapt to cultivation.

CEYLON CHALICE LILY — **PANCRATIUM ZEYLANICUM**

WYNDHAM HAYWARD, *Florida*

The amaryllids in which the lower part of the stamens are united and transformed into a cup or chalice are popularly known as the Chalice Lilies. The floral structure of the pancratiums is similar to that of hymenocallis but they differ in seed and other characters. Pancratiums are Old World plants, found from the Canary Islands and Africa to the Far East whereas the species of *Hymenocallis* are confined to America, excepting one species in western Africa. Pancratiums have hard, flat to angular black seeds and those of hymenocallis are roundish or angular, green or whitish and fleshy. The subject of this brief account is a species known to botany as *Pancratium zeylanicum,* first described by the master Linnaeus on page 417, in Species Plantarum, 1753.

There are not many bulbs of the Amaryllidaceae or Amaryllis family in the Old World, and this is one of the prettiest of either the old or new. A slight and lovely thing, one-flowered, with a stem only a few inches tall, but fragile and pure in its crystal white beauty. It reminds one in this quality of the rare and delicate *Leptochiton (Hymenocallis) quitoënsis* of the Ecuadorean slopes.

Pancratium zeylanicum (Fig. 24) was known to the pioneers of the plant world and was figured in the Botanical Magazine under Plate No. 2548 more than a century ago. The bulb is small, 1½ to 2 inches in diameter, roundish, with short neck, and requires Ismene (deciduous *Hymenocallis)* culture for success in Western areas. William Herbert reported in 1837 that it is ''very liable to perish here'' (England). The same is true today if its needs are not met with care and affection.

Bulbs are usually obtained from India, and in winter. Planted in spring in a sandy loam, slender light green leaves soon appear and in a few weeks or less the single flower puts itself up on a short stem above the gracefully arching leaves, which are a ¼ to ½ inch in width. The flower may be two inches across and the tepaltube two inches long. The tube broadens at the top with frilly bifid teeth between the free tips of the filaments, which extend an inch or more above the flower. The habitat of this charming miniature Amaryllid extends widely over South Asia, presumably in areas of lesser rainfall, as it seems to resent excessive rain in Florida. The vegetative and blooming period is short, a few weeks only, and then the bulb goes dormant again, exactly like the Latin American *Leptochiton* previously mentioned. All fall and winter into late spring, the bulbs stay dormant in their pots if left outside, but being tender tropical subjects the writer believes the bulbs in their containers should be placed indoors or in a shed or dried off under the greenhouse bench until spring comes again.

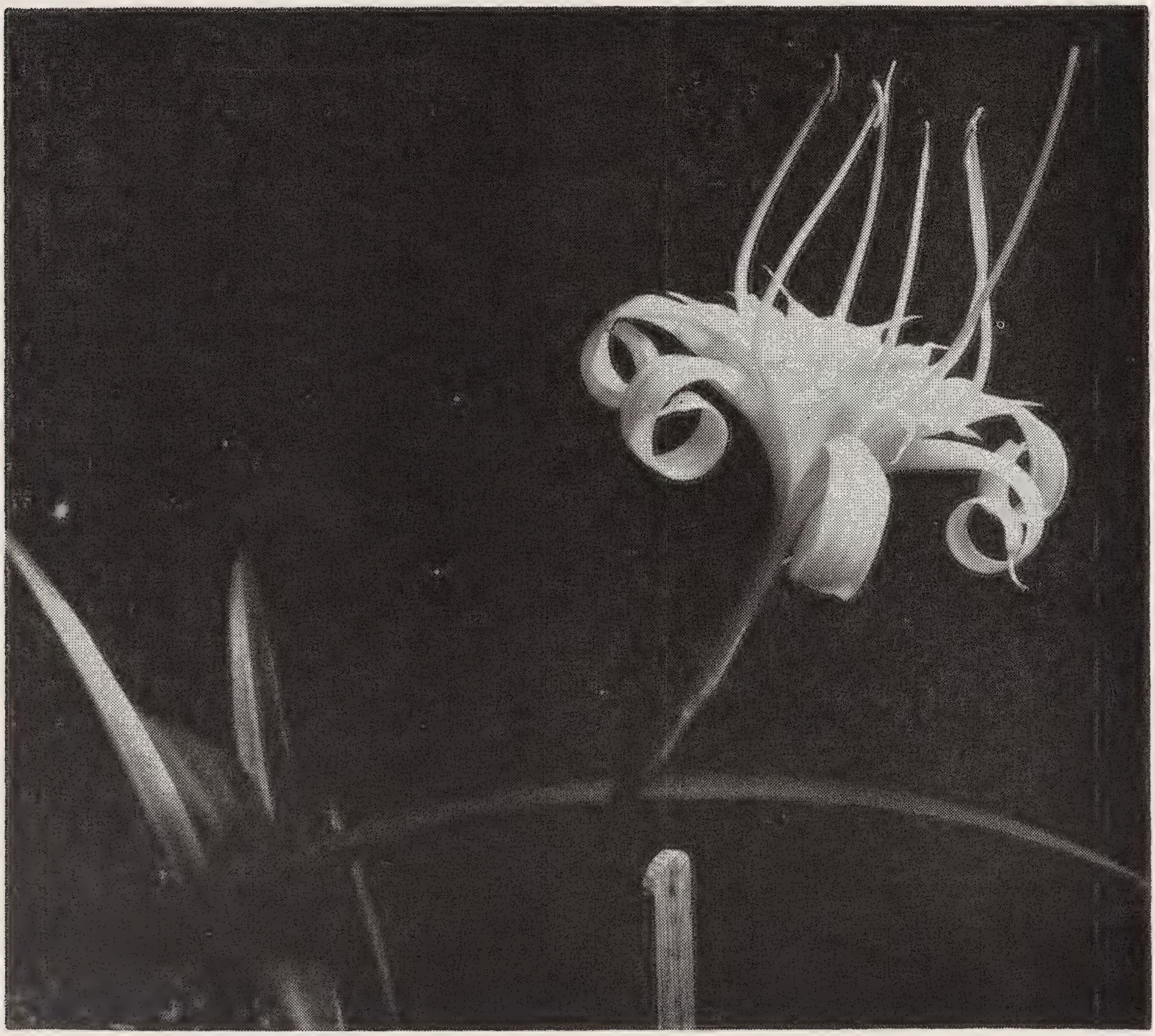

Fig. 24. Ceylon Chalice Lily, *Pancratium zeylaniaum.* Photo—Wyndham Hayward.

About three bulbs will do nicely in a 6 inch ''pan''. Drainage must be extra good, and the soil, a light but fertile sandy loam, with some enrichment of humus or rotted manure. The glossy green leaves are as charming as the flowers.

Baker in 1888 related that the plant was figured by Rumphius, the famous early Dutch botanist of Amboina in the Dutch East Indies, and by Commelinus, at the beginning of the 17th century. F. W. Burbidge the famous English plant explorer of the middle 19th century, made a figure of it at Labuan, (Borneo), showing the extent of its range eastward.

GARDEN CULTURE OF AMARYLLIS IN THE HOUSTON, TEXAS AREA

MRS. A. C. PICKARD, *Texas*

In our collection of various types of late winter and early spring flowering bulbs none have given us more pleasure than the Dutch hybrid amaryllis. Our collection of these bulbs was begun a few years ago and additions were made each fall so that now our collection, yet modest in size, boasts many of the finest hybrids adaptable to the climate and variations of gardening methods.

Because of their beauty of bloom and foliage, variety of form and wide range of color, they provide a focal point for garden activities and are a good topic of conversation. The hybrids are also the most popular bulb for potting to enjoy in the home. The flowers have 3 or more huge trumpets per scape and 2 to 3 scapes per bulb in cheerful colors from dark velvety red through salmon, orange, pink, rose pink, pure white, striped and varigated patterns and we are all waiting for the pure yellow and blue hybrids. In fact, all amaryllis are good except some are better than others. 'White Giant', 'Doris Lillian', 'Bouquet' are always prize winning favorites.

Many amaryllis fanciers have a high appreciation for some of the smaller blooms. So far the most outstanding strain in our opinion is the true red Gracilis strain with small velvety red flowers so suitable because of their size for house plants. We have found in growing this fine smaller statured amaryllis that it has generously multiplied by offsets as compared with the larger amaryllis.

Individual amaryllis plants vary greatly in their behavior under cultivation. Some are almost evergreen. Others lose all their leaves in the fall and some delay flowering for several months while others have a very short dormant season. We believe these differences can be attributed to inherited factors, to environment and to the kind of culture given during the preceding season.

The hybrid amaryllis has been greatly improved since the first hybrid, *A.* x *johnsonii* bloomed in 1800. It is still found growing in some old gardens although somewhat varied in form and coloring. The Dutch hybridizers continue to give us the most gorgeous hybrids available and the named clones will always be prized possessions. One reason is that when a grower has produced a superior amaryllis the method of growing enough to supply the demand is slow, and therefore your cost of purchase is much higher than for the ordinary amaryllis. But bring the lovely imported Dutch hybrids into flower and you will say it is worth the cost, especially when you take into consideration the long life of the bulb.

Perhaps the most common mistake made by amaryllis fanciers is the purchase of inferior stock. Avoid disappointment by being careful in selecting top size bulbs.

With so many from which to select, it is encouraging to know that the culture is simple. We like to pot our newly purchased bulbs since they are usually late in arriving which makes them get off to a slow start if set directly in the cold ground. Select a pot at least 3 inches wider than that of the bulb. The increased soil space makes a complete repotting unnecessary if the bulb is to be left growing in the pot with the thought of sinking in the ground for the summer. Soak the pot for several hours in water before potting as a dry pot will absorb the moisture from the soil. Use a soil rich in humus, and set the bulbs one half above soil level, water lightly around the edge and store the potted bulb at a temperature of about 60 degrees. Too much heat and moisture force the embryo buds before rooting takes place and this will likely cause the flower to have weak scapes and inferior flowers. Bulbs of the same size and clone will react differently. Many factors are involved in determining the length of time from planting to bloom. Don't be disappointed if it takes several weeks for growth to begin. By potting the bulb many difficulties can be overcome, especially when we are anxiously awaiting that prize bloom for the show. The appearance of buds or leaves perhaps both indicate the plant may be moved gradually to light and watered more steadily. Here on the Gulf Coast, with many bright warm days, the pots may be set outside to encourage more sturdy growth. When flowers begin to open, move to a shady spot to retain color and keep the blooms fresh. Check every day at this period and water often. When the bloom scape is a few inches high a light application of fertilizer will make a better bloom. Removal of the anthers as the flower opens prolongs the life of the bloom and keeps them free from pollen which tends to mar their beauty.

The simplest way to insure summer growth is to turn the bulbs out of the pots in late May and plant in rich soil in a well drained spot. Watering and feeding freely, preferably with liquid fertilizer, will make heavy foliage if they are in vigorous health. If you find a bulb that for some reason made poor growth or failed to root properly, trim it off at the base. Then, to stimulate root growth, dust the base of the bulb with a hormone powder and pot on a bed of coarse sand. Some bottom heat will be helpful. The amaryllis is practically fool proof; thriving very well if the new bulbs are planted directly in the garden although they are a little slower in rooting.

The secret, if there is one, of continued success with amaryllis is to keep the foliage growing vigorously through the summer months. Healthy bulbs increase in size each growing season up to a maximum, having shrunk considerably in size during the blooming period. This points to the importance of a regular feeding schedule in the garden. Partial shade is advisable to protect the foliage from sunburn as our Texas sun ''sure do get hot''. Mulch protects the bulbs from heat in summer and cold in winter. Plenty of water is needed during the summer, gradually withholding it from October on during the fall. With a few months rest period the bulbs are ready to repeat the cycle, and amaryllis enthusiasts can indeed look forward to a great future.

AMARYLLIS ROOTING PROBLEMS

WYNDHAM HAYWARD, *Florida*

The factors of root growth are major problems of amateur and professional *Amaryllis* culture, and consequently have always held an important place in the successful growing of *Amaryllis* in the hands of the flower lover or ultimate consumer.

The roots' growth, function and morphology, their seasonal cycles, if such exist, as seems strongly probable at this time, are among the least understood of all the problems of ordinary *Amaryllis* culture.

The hybridizer and grower of bulbs can combine the highest arts of the plant breeder, with the best fertilizing and irrigation equipment to produce under field or lath house or greenhouse conditions the best possible bulbs, but he cannot assure a strong root growth in the hands of the ''ultimate consumer'', the Amaryllis ''fan'' who buys the bulb in a department or seed store, florist shop, or from a mail order dealer.

Fortunately the bulb will bloom well in many cases even if it has not developed a new and adequate root system. This saves the situation from a complete loss, in the eyes of the flower lover. He may grow the same bulb for years before it blooms again, largely due to the failure to assure conditions which favor a strong root and leaf growth required for the re-establishment of the bulb.

Root growth is not such a problem in the young bulb, which seems to have an innate vigor which some of the older bulbs lack. In pots or flats or in greenhouse beds or benches (as in Holland) the bulbs progress thriftily from small seedlings until they are blooming size. Then comes the rub, when sold or otherwise disposed of, the new owner who pots up the bulb, follows all the best practices and precepts, but so many times, gets a short-stemmed undersized flower, with no foliage on the bulb and a few if any roots on the bulb. Often the blooming bulb falls clean out of its pot on the floor while being displayed to visitors and other admirers. Nothing is more disconcerting, more discouraging.

Growers meet similar problems in field cultures of the bulbs in California and Florida and presumably elsewhere. In Florida there are suspicious that the newly reported nematode foes of various plants are involved with the cultural difficulties of field growing Amaryllis. The root knot nematode is not likely to be involved, but other soil borne types as the ''burrowing'' nematode, the ''sting'' and ''lesion'' nematodes; all receiving critical attention in Florida horticulture at this time. These can be controlled by soil sanitation, at least in beds and pots.

Other factors are moisture, too little or too much. In Florida there are long dry periods and a likelihood of sudden drenching tropical cloudbursts and hurricane downpours during the main growing season of April to November in the open air. The dry periods are mainly in the spring, until the start of the rainy season in June. Then watering by irrigation of some sort, hose or sprinkler, is necessary for any important Amaryllis planting of the better hybrids. Otherwise the bulbs may be found to have dried off their roots completely in the sandy ground.

Wet weather in summer is often fatal to the root systems on Amaryllis bulbs in the lower South, especially in heavy soils and soils of general poor drainage. In lower land plantings after heavy rains in September, the height of the tropical storm season in the lower South, bulbs will be found to be loose in the ground with all roots rotted or partially decayed and reddened. Excess moisture is a great foe of Amaryllis and its avoidance requires good drainage at all times in a private or commercial planting. Raised beds are best, as the bulbs can be watered in dry weather and will drain off sufficiently in wet times.

Then too there is the problem of the composition of soils and the true preferences of the Amaryllis itself, which seems a reasonably tolerant plant, thriving when it does thrive, as it can be found, in soils in California above neutral or 7.0 pH and in acid soils in Florida down to 4.5 pH on peaty muck, as long as it is well drained. Growth seems better on the neutral or near-neutral soils, although Mulford B. Foster the plant explorer and Bromeliad expert, reports finding wild species of the Amaryllis growing in low, wet places and in moist heavy types of woods mould, rather loose and friable or compact but porus, and well drained, yet subject to frequent rains, heavy drip from trees and often mist and splash from nearby waterfalls, streams, etc. in South America.

Adequate water is necessary but the drainage must be perfect. In full growth, from June to October, water may be applied abundantly, if the drainage is good, with favorable results. Just what pH is optimum for the common hybrid Amaryllis today is still uncertain. They will stand a limed soil and again a rather acid medium with heavy admixture of leaf mold and peat. Possibly the humus content is more important than the pH within reasonable limits.

Under glass, heavier soils, even clayey types may be used as potting mediums properly mixed, as watering can be done under absolute control by a competent gardener so that there is no danger of flooding the bulbs in their pots. Well grown greenhouse Amaryllis will have beautiful roots when lifted from growing beds or knocked out of the pots in winter. Some Dutch Amaryllis arrived in the United States with magnificent root systems, still almost intact after their long ocean voyage in November and December from the Holland Amaryllis growers.

An experiment station project by some state college floricultural department in charge of an interested and scientifically minded graduate student or research worker is required to help solve some of these problems concerning re-establishment of Amaryllis bulbs and Amaryllis rooting in general. The Amaryllis world needs and deserves more scientific information on the optimum pH, optimum type, quantity and character of the humus content of Amaryllis soils in pots, beds and in the field; the best forms of fertilizer to use and the best methods of watering and seasonal quantitative requirements of the same.

As reported previously in the 1954 Herbertia, the writer has been experimenting with the use of sphagnum moss in Amaryllis potting mediums. There seems to be a definite inducement to the development of prompt, strong new root system from the use of sphagnum moss—when it is mixed half and half either with sand or clean sandy loam with added fine charcoal particles (poultry size as available at food stores) and dried, pulverized and sterilized cow manure such as is available under the Wizard Brand commercially. Such fertilizing materials are being put up under other brands, such as Swift's cattle manure, Driconure, and so on.

Two words of caution are necessary in connection with the use of the special sphagnum composts for Amaryllis growing. Growth is no better of course than under satisfactory or optimum cultures of Amaryllis in the usual potting and bed mediums, and drainage is just as much an essential or even more so because of the water-holding capacity of the sphagnum moss.

In 1954 and 1955 the writer has been experimenting with the growth of Amaryllis in chopped sphagnum alone, watered with Hy-Gro, Ortho-Gro or similar chemical or organic liquid fertilizer. Particularly good results have been obtained in the growing of Amaryllis bulbs in pure chopped sphagnum in gallon cans with plenty of drainage holes at the bottom, when mulched with commercial dried or composted cow manure. An excellent quality of the composted dairy manure has come on the market in recent years, dark and well decomposed, and effective as a potting soil medium as well as for mulch.

It is necessary to repeat that drainage must be of the best, and if gallon cans are used, clean, fresh cans painted with some rust resistant paint are desirable, as Amaryllis roots seem to find the rusty metal sides of an old tin can very toxic; the roots die off at contact with the sides of the cans and the bulbs make only a reduced growth. Some commercial gallon cans remain in good condition two or three seasons without painting, but others become poisonously rusted (to Amaryllis) in a single season.

A rust resistant paint which can hold up under contact with the potting medium and watering is necessary, and is difficult to find. Gliddens special rust resistant paints have proved effective in the experience of others. The writer is experimenting with ''Asphaltum'' a Sherwin-Williams asphalt paint product, which is mixed half and half with mineral spirits to thin and 1/12 of a good ''drier'' added.

The problem of dozens and even hundreds of containers or ''pots'' is a real one for the amateur or professional grower. A six-inch clay pot is too expensive and too small for the root system of a large Amaryllis bulb under average conditions, and does not provide enough feeding area. A gallon can is inexpensive, obtainable at schools and restaurants, and properly treated against rust, will last for years with good results in the way of producing good root systems. The writer makes six holes in each can with a beer can opener on the outside of the can, at the bottom, for drainage. He is experimenting with new plastic pots and "pans", 6 and 7-inch sizes, of Union Products, Inc., a plastics firm at Leominster, Mass., this season in growing Amaryllis and will report on the results affecting root growth problems in a future article.

PSEUDOSTENOMESSON VARGASII

Edith B. Strout, *California*

Pseudostenomesson vargasii Velarde was one of a group of bulbs received in 1950 from Miss Elaine Breckenridge who had gotten them directly from Peru. Planted in early November, it amazed me not only by breaking its long rest and growing immediately, but by flowering on November 25th.

The plant seems closely allied to the Ismenes, with similar type leaves of from 6 to 12, though usually only a few, from three or four, have developed at time of flowering. There is a 5-inch long neck, with the leaves fanning out at the top. This has led me to think that in its native land it probably grows in thick grassland and that the bulb is rather deep in the soil.

The flower peduncle does not come from the side of the bulb as in amaryllis, but from the center of the leaves, as is so similar to the hymenocallis group, and it is also distinctly flattened and two-edged as with *Hymenocallis.* The peduncle is 10 to 20 inches above the top of the neck, or 15 to 25 inches from the soil.

Pseudostenomesson vargasii is a shy, retiring miss, for she puts on no show, decking herself out in the same green for leaves, stalk and flowers! (Fig. 25) The five to six green tubular flowers are 1¼ inch long, with the same length narrow tube, so the effect is of 2½ inch pendant bells, with the exserted pistil furthering the illusion of the clapper. The only contrast in the flowers is a narrow lighter green mid-rib on the inside of the petals, and the yellow anthers. The pedicles are very short, ¼ inch, and the spathe 1¼ inches.

Seed set only once, in 1954. The ovary appeared to be 3 celled, and only one cell in each of two ovaries developed into a seed. Considering the small size of the flower, the seed was very large, one was ⅝ and the other ¾ inches in diameter, each being green, round and fleshy. The seed was so heavy the peduncle bent way down to the ground, all ready to drop the seed some 18 inches from the parent plant. If naturalized, there soon develop a ring of seedlings around the parent bulb. One seed was sent to Dr. Traub and the other to Mrs. Polly Anderson, both living in southern California. I shall be very interested to learn at a future time how the seed develops and how long it will take to reach flowering size.

I have my bulb planted in a 10″ pot, in compost and leaf mold. It has never been transplanted, but occasionally a little fertilizer has been given. I had assumed that the stenomessons were winter growing, so planted this in November the first year I received it. I have been very interested in watching how the bulb has been gradually accommodating itself to its surroundings. It is with hybrid amaryllis in a cold frame, which is covered with cello-glass in winter, our rainy season. Though very damp, there is not a great deal of moisture in the winter time in the frame. In summer, occasional sprinklings with a hose are given, not as much as the bulbs should have, and I feel they are kept on the dry side. The blooming dates of this stenomesson have been steadily advancing, as will be seen from the following: 1950, bloomed November 25th. 1951, did not bloom. 1952, bloomed in October. 1953, bloomed in September. Bulb split into two equal size sections, both sections blooming. 1954, August 12, only one of the divisions flowered. 1955, bloomed July 26, both divisions sending up one stalk each. I shall be interested to see where it stabilizes its blooming date. At the present time it seems to be a summer growing and flowering bulb instead of a winter growing one.

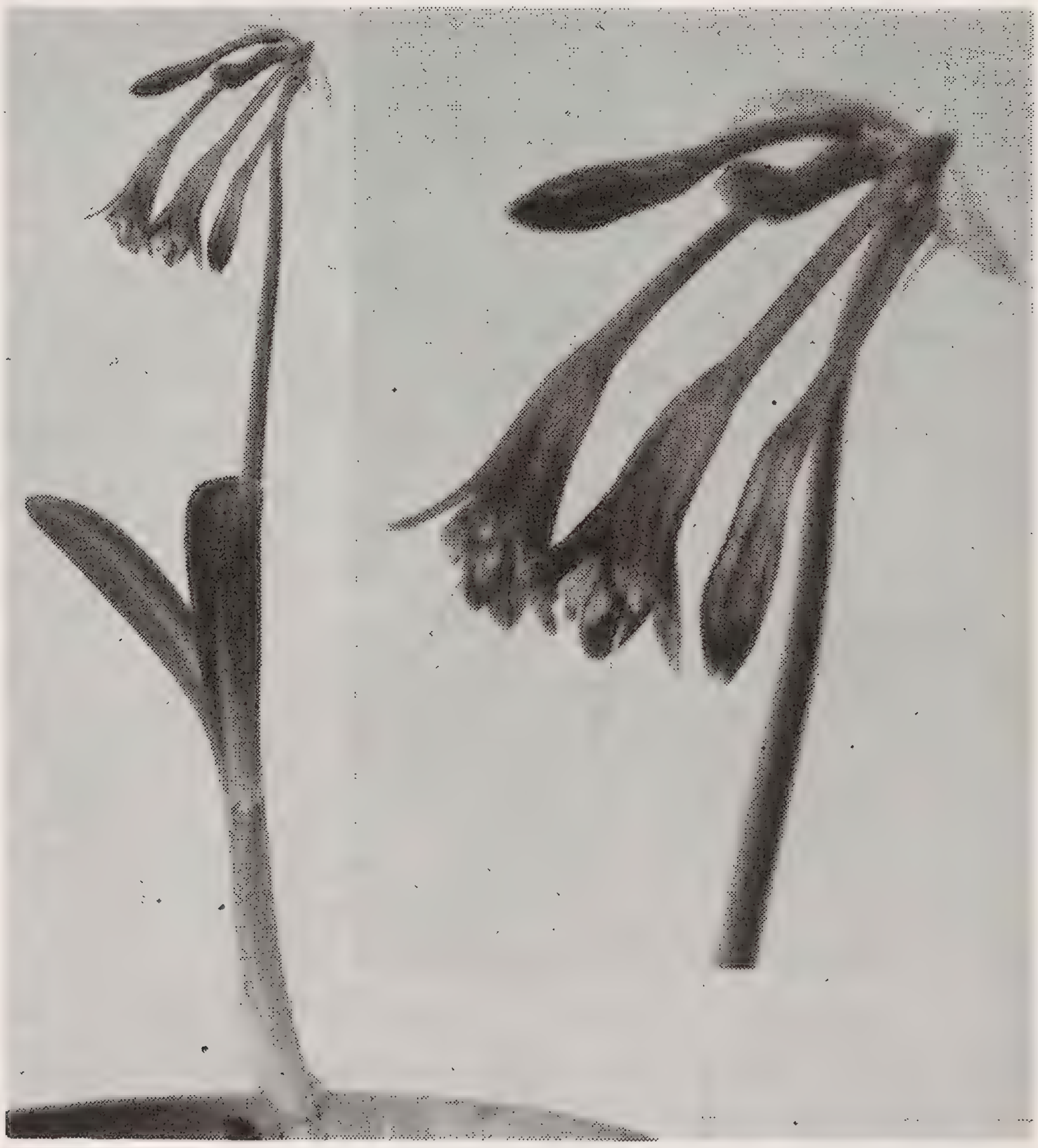

Fig. 25. *Pseudostenomesson vargasii.* Photo—Edith B. Strout.

It stands our outdoor temperatures here, which go to 20° F., but it is covered and given slight protection. As it is not a showy plant, even when in bloom, and as it also needs considerable room for the bulb is large, it will probably never be popular as a greenhouse subject, but in large clumps might be of interest in frost-free areas as a garden plant.

I wish I knew more about its habits. Its greatest value to me, outside of its rarity, is that it has been the only stenomesson that I can get to bloom regularly, and it seems to thrive on my neglect and is able to accommodate or acclimate itself to its surroundings.

[Editorial Note.—The seed of *Stenomesson vargasii* that Mrs. Strout kindly sent to the writer survived the moving ordeal in 1954 and has grown into a sturdy medium-sized plant in one growing season and will perhaps bloom in 1957 after another growing season. Thus it seems to be a plant of easy culture and should become popular in amaryllid collections.—*Hamilton P. Traub*]

REGIONAL PERFORMANCE OF DAYLILIES

Philip G. Corliss, M.D.
Somerton, Arizona

Like many other daylily enthusiasts, I saw my first named hemerocallis clones as a corollary of a visit to an iris grower. In my case, it was at Mrs. Thomas Nesmith's Fairmount Gardens in Lowell, Massachusetts. But before my first horticultural hybrid daylilies had even been planted, I had an initiation regarding the regional performance which is so important in any consideration of the garden value of these flowers.

I returned to Arizona having ordered many clones recommended to me by Mrs. Nesmith and Dr. A. B. Stout. My belief that I would be introducing daylilies to the gardeners of our valley was soon dispelled when I found that one of our most capable gardeners had been growing hemerocallis for a number of years. Most disconcerting, however, was being told by him that daylilies would not grow in the Yuma region. The only exception, he said, was 'Sir Michael Foster', which was so satisfactory that he was ordering it in large quantities because of its landscape value. In his garden he showed me many highly rated named clones which had failed to perform well. For the most part they were represented by small stunted fans. My host explained that he had tried every cultural device without avail to encourage better performance. (To my joy, I found that my friend's experience was not completely repeated in my garden.)

My second great lesson in regional performance was learned when I began several years of extensive travel to visit the breeders and growers of all parts of the country in assembling material for my book (HEMEROCALLIS: THE PERENNIAL SUPREME, pub. 1951). In the extreme southeast I was often shown puny plants with a remark such as: "Look at that wretched daylily—it was introduced at an high price in the north. I have thrown away thousands of seedlings better than that."

Even today, the recognition of the importance of regional performance is so poorly comprehended that I am becoming increasingly reluctant to recommend any specific daylily. My luck in picking clones with a wide range of good performance reached its peak with 'Garnet

Robe', which I pontificated was the best daylily introduction in 1948. (It has been the most highly placed red daylily on the Popularity Poll of The American Hemerocallis Society.) Even in regions where introductions of all the principal breeders will grow, there is such uneven performance that gardeners express surprise at the high rating of certain clones, not realizing that some environmental factor is militating against optimum performance in their garden.

The principal factors (in addition to the cultural practice of the gardeners) affecting performance are: (1) Temperature. This includes the daily swing, soil temperature, night readings, as well as seasonal variation and the occurrence and duration of freezing temperatures. (2) Water. This includes annual rainfall and seasonal distribution of same; drainage and runoff; pH reaction of water used for irrigation. (3) Sun and shade; and (4) Soil condition; including pH, subsoil structure as well as composition of topsoil; degree of salinity or alkalinity and absence of vital elements, minerals, organic matter, etc.

In floriculture, as in every field, "authorities" express OPINIONS which are accepted as FACTS by many. Many erroneous opinions become so firmly established that it is often difficult and sometimes impossible to dispel them. Examples: (1) Dykes and other early writers said that butterfly (spuria) iris preferred acid or at least neutral soils; yet one of the species is I. *halophila* ("salt-lover") and I have yet to find a garden where the butterfly iris thrive as they do in my alkaline soil. (2) It was said that daylilies will not bloom well in shade: some varieties offer outstanding refutation of this premise. (3) It was also said that daylilies are not subject to fungus, virus, bacteria, or insect pests! (Shades of 1920, before the gladiolus thrip showed up!)

EFFECT OF THESE FACTORS ON DAYLILY CHARACTERISTICS. Let us now consider briefly how certain characteristics of daylilies are affected by the factors listed above:

VIGOR OF GROWTH: Certain clones multiply prodigiously in regions to their liking while they remain a single fan in others. This performance is not necessarily limited to climatic regions but may be noted in different parts of the same garden where environmental factors vary. In the extreme south, where no period of cold-dormancy occurs, many northern-bred clones bloom well the first year when husky plants with heavy fleshy roots are received. In succeeding years, some of these plants fail to bloom; their foliage diminishes; finally, after lingering for perhaps several seasons and being reduced to the size of blades of grass, they disappear completely.

HEIGHT: While there are many exceptions, it is as true of daylilies as it is of daffodils and bearded iris that those clones which are bred to withstand cold dormancy and a minimum of extreme heat will be forced into bloom in hot climates before they have had time to develop stalks of expected height. Conversely, southern-bred varieties in the north achieve heights not expected in the gardens of their origin.

SIZE OF FLOWER: The same factors which affect height operate to produce the size of the flower. The ten-inch mastodons of the south may not be impressive in the north, but even more distressing is the lack of size in southern gardens of the northern-bred clones.

PROLIFERATIONS: In the south, proliferations on the bloom scapes are commonly called ''aerials''. The many reports of lack of proliferations or multiplicity of them in certain years suggests how sensitive they are to environmental factors.

RECURRENT, (REMONTANT), OR CONTINUOUS BLOOM: A second blooming period is usual in but few clones in the north. Most hemerocallis, when established and well-cultivated, repeat at least once each season in the far south (but not all of them do!). The single bloom period in the north results in scapes with greater numbers of flowers, while the repetition of the cycle in the south may give scapes with less branching and fewer flowers. I have frequently regretted the tendency of northern growers to breed for late-season bloomers instead of using parents which will produce early but recurrent bloom. My preference for high close branching is accepted by some but disputed by many. I dislike the heavily-branched scape with the last flowers blooming low and surmounted by stumps and/or pods. The recurrent bloomers with high branching provide good cut flowers (and such use will stimulate their cut-and-come-again habit) and are also more attractive in the garden—the daylily is gradually overcoming an established prejudice based on the erroneous belief that it is not a satisfactory flower for cutting use. Of interest is the increasing number of introductions which have a habit of producing new flower buds at the terminal ends of the scapes.

COLOR: All of the environmental factors are important in the production of the color of flower and foliage. Deficiences or excesses of many of the factors may produce variations in the same garden; but there are differences in regional performance which are constant and striking in many cases. Clones described as pink by their originators may be deep rose or brownish in some regions; red selfs or bitones actually become bicolors in other areas.

INFLORESCENCE: Temperature is the principal factor affecting the duration of the individual flower and its TIME of opening and closing. In cold weather (even in my climate) most flowers will hold blooms open for two or more days. I have no liking for flowers that remain open so long that they lap the flowers which follow them—the old flowers are faded or perhaps marred by mechanical trauma of wind, man, animal, or insect. Many gardeners, like me, had presumed that flowers open on the first morning inspection of the garden but not blooming the preceding evening, had opened at sunup. Actually, many classed as ''diurnal'' bloomers open before midnight or at some hour shortly thereafter. Such flowers are spent at the end of the day and are accused of fading or closing early. Such a flower is the indispensable 'Show Girl' (Wheeler) which opens usually an hour or two before midnight.

Flowers which remain open in cold climates or cold weather until

[DAYLILY PERFORMANCE—DR. CORLISS, continued on page 161.]

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GENERAL EDITION

EDITED BY
HAMILTON P. TRAUB
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THE AMERICAN PLANT LIFE SOCIETY

Box 150, La Jolla, California

PREFACE

In this General Edition of Plant Life the readers are favored with a number of interesting articles. L. Maurice Mason contributes a charming report on the Ghent Floralies and the Chelsea and Southport flower shows. Mr. James writes about his vacation trips and the Big Trees and Redwoods of California, with illustrations. Mr. Hayward contributes articles on the culture of the Arborescent Philodendrons, Helicondias and Curumas in Florida, and Pete Sulen favors us with the first article on the Banana to appear in Plant Life. Mrs. Wyler reports on the Amaryllis and Bulb Society Show, 1955, in New Orleans. The Plant Life Library (book reviews) completes the edition.

December 15, 1955,
5804 Camino de la Costa,
La Jolla, California

Hamilton P. Traub
Harold N. Moldenke

THE EDITOR'S MAIL BAG

The members are familiar with the excellent tropical and subtropical plant collections of Lakemount Gardens, Mr. Wyndham Hayward, prop., Winter Park, Fla., and Mr. Mulford B. Foster, 719 Magnolia Ave., Orlando, Fla. They will be pleased to hear that a similar collection has been built up through the years in the Southwest by Mr. Bavid Barry, Jr., proprietor of California Jungle Gardens, 11977 San Vicente Blvd., Los Angeles 49, Calif. A copy of the first catalog, 1955-56, has just been received and it was a revelation to page through this first issue. The plant material selected for listing is of the highest quality and covers a very wide range from Bromeliads, Alocasias, gingers, bananas, ferns, philodendrons, and so on. Mr. Barry is to be congratulated on his excellent taste in choosing his plants. The illustrations in the catalog are of the finest quality.

The Yuma Valley (Arizona) Iris Society is sponsoring a one-day tour of Yuma iris gardens on April 23, 1956, with lunch at the home of Dr. and Mrs. Corliss, for members of the AIS going to the annual meeting in Los Angeles. For reservations, write: Mrs. E. E. Evans, Route 1, Box 100, Somerton, Ariz.

GHENT FLORALIES, AND FLOWER SHOWS AT CHELSEA AND SOUTHPORT

L. Maurice Mason, *England*

This year the writer was lucky enough to visit three of the loveliest and almost certainly the largest flower shows in Europe. He refers to the Floralies at Ghent, which was held towards the end of April, the renowned Chelsea Flower Show towards the end of May and that at Southport towards the end of August. The Floralies at Ghent is perhaps primarily a Commercial Growers flower show and there undoubtedly the finest Indica Azaleas in the world can be seen, some of them pruned and trained in almost fantastic shapes yet covered with flowers so densely that it is not possible to put a twig in without touching a bloom.

The Floralies perhaps is most remarkable for the fact that it is laid out in an over-all pattern, with a vast centre hall one blazing mass of Azaleas and from it radiating halls, some containing masses of orchids and what are known as stove plants in Europe and others containing collective exhibits from many European Countries. The main hall this year was out lined round the sides with groups of ferns, palms, figs and one very lovely woodland garden staged by the Commercial growers of this country. This latter caused perhaps a special stir as it was so widely different from the majority of the exhibits. It showed what one might expect in a leafy glade in the South West of England in May, and with its primulas, rhododendrons and many other typical woodland plants made a pleasing, quiet, scene which contrasted well with some of the blazing colours of the Azaleas. Perhaps the introduction of stuffed pheasants and wild birds was a mistake but the over-all effect was picturesque to a degree and was much admired by the many hundreds of thousands of visitors to the Exhibition. I do not know where else in this world one could see so many orchids grouped together as there were in the orchid hall where wide water falls tumbling down in many tiers, surmounted by magnificent plants of *Medinella magnifica* from the Belgium Royal Gardens made a most wonderful effect. It would be invidious for the writer to pick out any firm's exhibit as being outstanding as they were almost all professional and reach that degree of perfection which now a days is so seldom seen. Cypripediums, Odontoglossums, Vandas, Phalaenopsis, Miltonias, vied with one another in their brilliance of colour and the excellence of their condition. A superb group of Bromeliads possibly covering two thousand square feet with huge Platyceriums amongst it caught one's eye but wherever one turned there was something new and interesting to see. It was difficult when the show was opened to stand and admire any particular group so large was the attendance. A German Exhibit of Cypripedium species was outstandingly interesting and the writer who was lucky enough to be judging orchids had perhaps a better opportunity of studying them than

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most visitors. He was startled to hear one exhibitor remark that he was taking back almost as many plants as he was exhibiting as he had not room enough for them in his group. It can well be appreciated that under these circumstances nothing but the very finest was on view. The exhibitors at this show and in this section made great use of small pots of ferns and Selaginellas and the more common Bromeliads to provide finishing touches to a group, and the whole effect is artistic in the extreme. In another section were the collective groups from Holland, from France, and from Switzerland and as can be imagined the Dutch Florist Flowers were indeed superb; huge vases of lilacs, carnations and tulips dominated the scene and the pots of *Saintpaulia ionanthe* and *Cyclamen persicum* hybrids were of a size that perhaps was almost too big. So much so that it was a relief to turn to a cactus garden where strange Euphorbias, weird Opuntias, and other peculiar freaks of nature reared their ugly yet strangely attractive heads. As a strictly commercial show it can be appreciated that some of the groups perhaps lack interest, containing as they did fifty to a hundred examples of one single plant. To quote, for instance, *Ficus elastica* so commonly grown as a pot plant on the Continent, would be shown in a group with each plant exactly the same and all obviously in the peak of health, but to one who is more used to the English Flowers with their endless variety these did appear somewhat monotonous. Another hall was almost entirely devoted to a group of plants from the Brussels Botanic Gardens, featuring as was inevitable plants from the Belgian Congo and other possessions which are seldom if ever exhibited. The difficulty of transporting plants and their containers that weigh several hundred pounds can only be appreciated by one who has seen the group being erected or who has taken part in it.

Another feature of this show is the number of competitive classes of which there were several hundred and where in some cases the prize money ran to very considerable amounts. The task of judging these was difficult in the extreme but was carried out in a most efficient manner by panels of three to five judges all experts in their own particular line. As the result while judging commenced at 9 o'clock in the morning by 3 p. m. in the afternoon every exhibit had been judged and the prizes awarded and the cards fixed to the stand itself.

To turn from this exhibition to the world renowned Chelsea Flower Show was a contrast indeed, for here at Chelsea is exhibited in one vast marquee covering three acres almost every plant and vegetable which can be grown in England either under glass or out of doors. Perhaps to a stranger among the most startling exhibits must be those of the vegetables. For here are vast piles of Peas and Carrots, Beans and Potatoes, many out of season yet all appearing in perfect condition and all eminently fit to eat. The arrangement is always superb and the competition between the various professional growers intense to a degree. I think the point which strikes me most is always the beauty of the arrangement because when standing a few yards back from one of these huge groups a beautiful over-all picture is obtained.

Orchids are not so much in evidence at Chelsea nowadays as the expense of growing them in a heated glass house is rather too high, but there are always six or eight very lovely groups. The high light of the Chelsea Flower Show is usually one of the beautiful primula and rhododendron gardens which are put up either by the Royal Horticultural Society itself or the Commissioners of Crown Lands from Windsor Great Park or from one of the noted private gardens of this country. They tend to form rather the same over-all pattern and are usually laid out as a Woodland Walk, and are perhaps most remarkable for the diversity of plants which they contain. Here can be found primulas from the high Himalayas as well as lowly primroses from the English country side. Rhododendrons which may have come from China or Thibet or Northern India and many rare lilies which can be found in no other country in the world. But these are by no means the only outstanding exhibits at Chelsea, where the huge groups of annuals containing many thousands of plants in pots massed together to form one vast mass of colour and with most entrancing scent are superb to a degree; the groups of annual plants such as cinerarias which can only be grown in green houses in this country are also very large and of a most striking brightness of colour and showing the great care which had been exercised in their cultivation. This year a gold medal was awarded to a group of strawberries from one of the women's Horticultural Colleges and another was awarded to a group of cacti put up by a man who had spent most of his life as a professional soldier. Here too can be found many hundreds of stands exhibiting all sorts of Horticultural requisites from books to lawn mowers. These form an avenue outside the tent itself and are always crowded with visitors for the five days that the show is opened. I should have mentioned in passing that the marquee itself is the largest single tent erected in the world. There are many formal and informal gardens too which give great pleasure to the visitors and must be extremely costly for the exhibitors who lay them out. Some are arranged as rock gardens with alpine plants, trickling streams and a small pool; and some as pure, formal gardens with stone paths and a summer house and perhaps a fountain with a stone figure beside it. Some of the exhibitors retard their plants in cold storage rooms and bring them out at the peak of perfection for the time that the show is on. Some others are forced into premature flowering so that the rather unusual sight of flowering cherries and dahlias side by side can be seen. Tulips too are always exhibited in great quantity although these from the fact that they have had to be retarded are not usually at their best by the end of the show. On the other hand sweet peas which have been forced into flower always seem to be at their very best and hold their dainty freshness throughout, and superbly arranged, are in many ways one of the more attractive features of the show itself.

There is however, so much to admire at Chelsea and so much to see that it is difficult to pick out which is the exhibit that pleases most, some enthusiasts spending all their time round the many small table exhibits of alpine plants, while others who make roses their special fancy will find many of every species, variety and hybrid there to attract them. I should emphasise again that it is the diversity of this Chelsea Flower Show which is so remarkable, and which can but emphasise the fact that the English are a race of gardeners perhaps pre-eminent in the world. There are no formal competitions at Chelsea except the flower arrangement classes which are very popular in this country, and for which purpose many societies have been formed. Here it is by no means always the most expensive and elaborate arrangement which wins the premier award, but it may well be a simple vase containing flowers and leaves which can be picked from any hedge side.

To pass from Chelsea to the Southport Flower Show is not too easy for the latter is held at the end of August at a seaside resort in Lancashire, and while not on the same scale as the other two which I have mentioned is still very remarkable. This year the writer was judging tender plants, begonias, and carnations all of them exhibited by amateurs. Carnations were superb and the task of picking out the finest was nearly impossible, and it would have been indeed difficult to have given satisfaction to the many exhibitors. While it is possibly the same with the large flowered begonias with their huge heads of striking colours and their perfection of growth which showed what time and care had been lavished on them. There was one unusually interesting group, and that was of various fruit trees all in fruit and all grown in pots. Any one who has tried this will realise how difficult it is, particularly if they have to be transported as happened in this case, a distance of nearly 250 miles. But the fruits arrived unblemished and with their bloom still on them, and were greatly admired, as much for the number of varieties which were brought as to the excellence of their condition.

The modern hybrid gladioli almost always of Dutch origin are shown extensively here and make a wonderful picture with their huge spikes, perhaps a little stiff and formal, arranged in vast containers. One or more of these groups must have been over one hundred feet long and ten feet deep, and some idea of the number of spikes required can be easily imagined. Chrysanthemums too are always shown at their best here and rival the huge heads of dahlias which are arranged in serried rows along sides of the marquees.

The specialist looking for orchids or ferns, or bromeliads here would be disappointed as there are only very few groups, and those are not of particular merit. Herbaceous plants too have rather had their season but the many thousands of visitors who attended this show obviously had all their money's worth, and every group was packed with admiring visitors, at times it was scarcely possible to move at all. The show was held during an unusually hot period and at one time the temperature soared well over the hundred, and conditions were almost unbearable.

THE SEQUOIAS—THE CALIFORNIA BIG TREES AND REDWOODS

WILFRED McD. JAMES, *California*

The trees comprising the Sequoia group are of ancient origin. Although only two species are living now, in relatively restricted areas almost entirely in California, fossil remains of several species have been identified. Near Calistoga, California, is a spectacular geologic oddity. A petrified forest covers an area of almost three-quarters of a square mile. This is an ancient redwood forest half buried in volcanic ash. Some trunks which have been exposed are eighty feet long and twelve feet in diameter. Petrifaction was accomplished by silica-laden water replacing the wood structure. It is on the slopes of Mt. St. Helena, which is in an area of ancient volcanic action and a series of folded lava flows, although no cones were built. It is not nearly as spectacular as the Petrified Forest in Colorado, but it is evidence of the antiquity of the genus Sequoia. Fossil remains of the Tertiary period found in many European countries from Italy northward to Spitzbergen, and in Greenland, the mouth of the McKenzie River in Alaska, Vancouver and southward along the Pacific Coast to California indicate that these trees were once widely distributed over the northern parts of the earth.

The genus *Sequoia* Endl., belongs to the Gymnosperms and is included in the Taxodiaceae along with seven other genera with one to three species each which are widely scattered over the earth. Of this group, *Taxodium, Cryptomeria, Cunninghamia, Sciodopitys* and *Metasequoia* are cultivated in California.

Sequoia gigantea Dec., commonly called Sequoia and/or Big Tree locally, inhabits a relatively restricted narrow strip on the western slope of the Sierra Nevada Mountains. This runs from Placer County on the north southerly to Tulare County, a distance of two hundred fifty miles and includes an area of about fifty square miles.

In the northern half of this region, the ''Big Tree'' is always mixed with other coniferous trees, but is mostly restricted to very definite localities of limited extent which are called groves. These groves, which occupy locally favorable spots, are few in number and very much isolated north of King's River. In the basins of the Kings, Kaweah and Tulare Rivers the trees are more numerous, more widely distributed through the forest and may be said to form an interrupted belt. In the northern part they are found at altitudes varying from 47 to 5800 feet, and in the south from 5000 to 7500 feet. The average rainfall is 45 to 60 inches, the snow becomes two to ten feet deep and lies on the ground three to six months of the year.

Sequoia sempervirens Endl. (Fig. 27) is commonly called Redwood now. In the old Spanish days it was called Palo Colorado (Red Stick). An isolated specimen in Palo Alto (Tall Stick) was called Palo Alto by the Spaniards and gave the town its name. It was visible for thirty miles and was used as a monument or base for the early Spanish land surveys. It is still standing, but is in poor condition because of the smoke from many commuter trains which pass close by daily. The

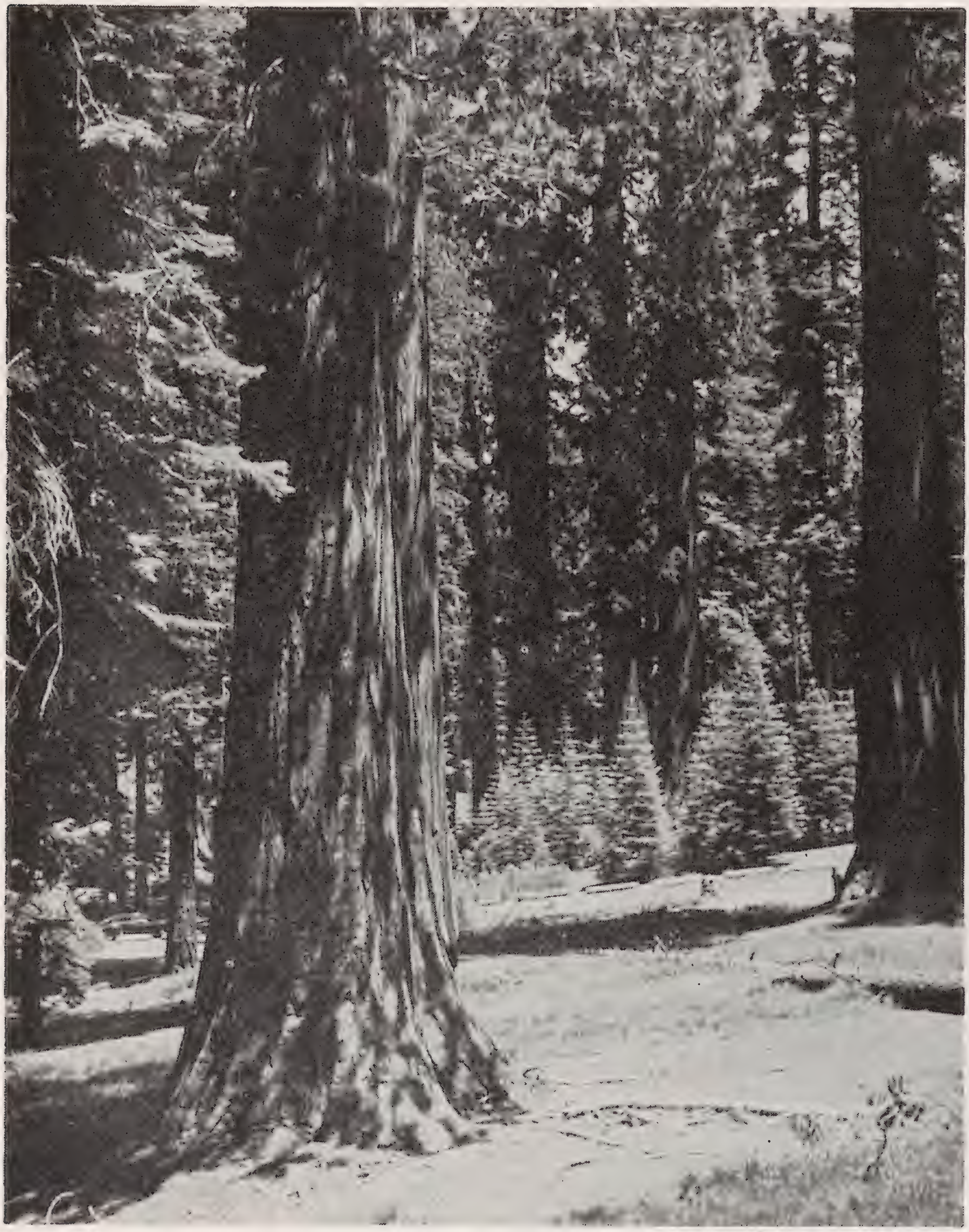

Fig. 26. Young *Sequoia gigantea* in Mariposa Grove at Yosemite National Park. Photo—W. M. James.

"Redwoods" inhabit the humid coastal region of the south-west corner of Oregon and of California from the northern border to Monterey

County in a narrow strip 450 miles long and averaging twenty miles in width. In the belt proper the trees grow on the slopes of canyons and the river flats of streams belonging to the outer or seaward Coast Range facing the ocean.

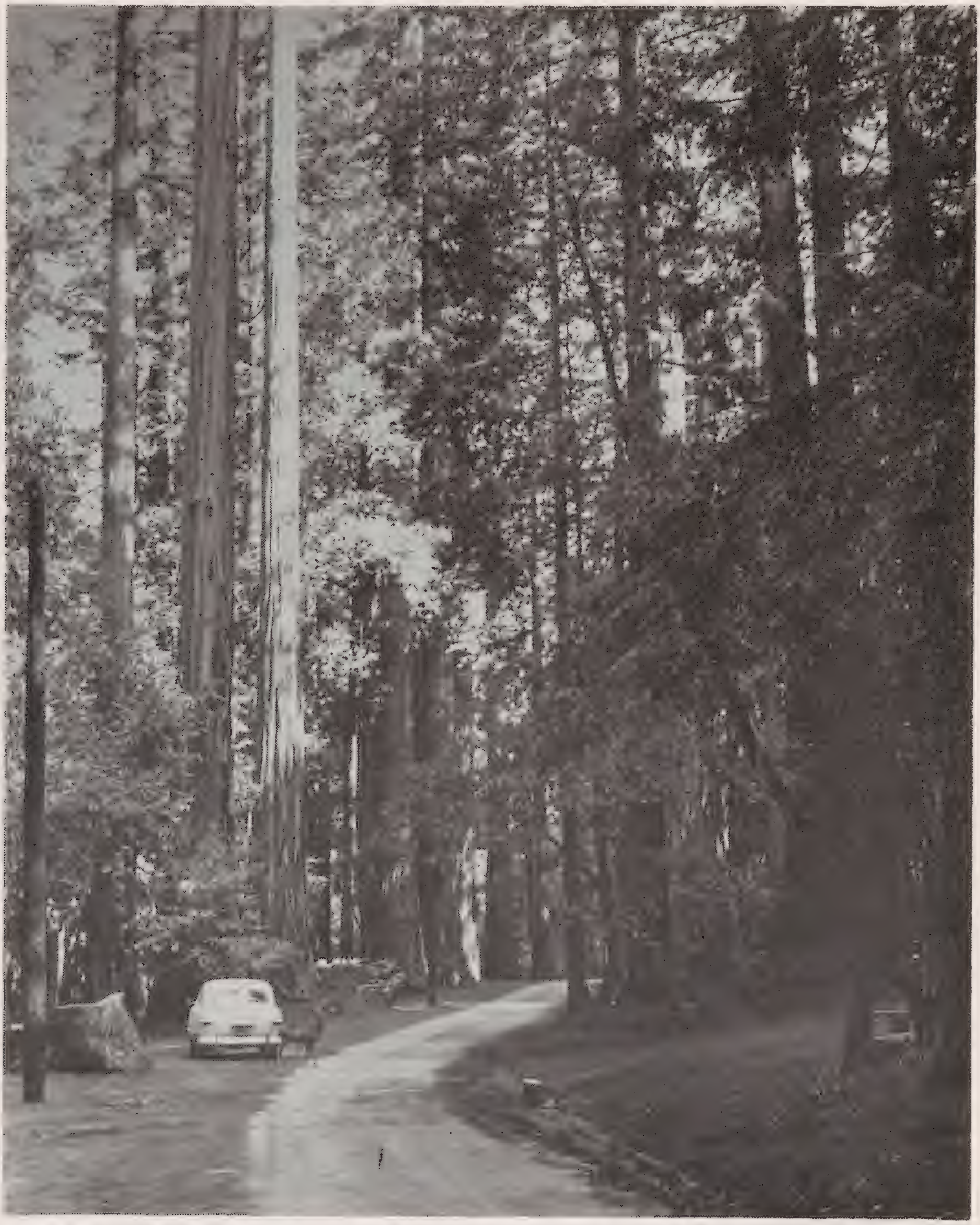

Fig. 27. *Sequoia sempervirens* in Big Basin National Park. Photo—W. M. James.

The main "Redwood" body occurs in a belt which begins in Del

Norte County, California, on Smith River and extends southward through Humboldt and Mendocino Counties to southern Sonoma. The Redwood Highway runs through part of this region where the ''Redwoods'' almost completely monopolize the alluvial benches of the river bottom lands. These are said to be the heaviest stands of timber in the world.

Farther south the ''Redwood'' occurs in the deep canyons of southern Marin County, just north of San Francisco, and to the south along the western slopes of the Santa Cruz Mountains. The Redwood Belt in these mountains extends from the San Mateo County line nearly to the Pajaro Valley, a distance of twenty five miles. Several localized groups of outstanding trees are found in this region. Most of the area was cut in early days.

There is a gap between Monterey and the Santa Lucia Mountains where almost none of the *Sequoia sempervirens* are found, because of unfavorable soil and climatic conditions.

In the Santa Lucia Mountains the scattered remnants of the ''Redwood'' are confined, on account of the excessive aridity of the region in general, to the canyons cut out of the abrupt western slope overhanging the ocean. These canyons are deep and narrow with very precipitous slopes (see ''Abies venusta'', PLANT LIFE, Vol. 11 page 116). The trees are mainly individual specimens and are not as large as those farther north. The southern-most trees are in a gulch just north of Salmon Creek Canyon twelve miles south of Punta Gordo (Cape San Martin).

The rainfall in the northern part of the ''Belt'' averages fifty inches annually with isolated areas getting up to twice as much. The average decreases southward to twenty seven inches at Santa Cruz and fifteen inches at Monterey. Again, isolated areas in these regions receive more than the average. Summer fogs are more prevalent in the southern part and help provide the humid atmosphere that the ''Redwood'' likes. The ''Big Tree'' is the larger of the two, being 150 to 340 feet high with 80 to 225 feet to the first limb and 5 to 30 feet in diameter six feet above the ground. The ''Redwood'' is the taller, being 100 to 350 feet high with up to 100 feet to the first limbs in dense forests, and 8 to 20 feet in diameter eight to twelve feet above the greatly swollen base.

Both kinds of trees are heavily buttressed and are very deeply furrowed at the base. The bark is very similar except that of the ''Big Tree'' is a slightly lighter color and with larger ridges and deeper furrows. (Fig. 28) It is often 12 to 18 inches thick at the base of both kinds and is very soft, almost spongy, being composed of fine fibers.

The wood is similar in some respects. The earlier growth of both kinds is coarse grained and the later growth fine grained. Both have a brilliant rose-purple color when first cut, becoming more and more dull purplish red-brown. The ''Big Tree'' wood (Fig. 29) is lighter in weight and more brittle than that of the ''Redwood''. Both woods are noted for their long endurance without protection. The white sapwood of both decays quickly. Both the bark and wood of each kind are high in tannic acid, which makes them disease and pest resistant. The bark is somewhat fire resistant and many large trees have had the center burned out and resemble a living pipe on end.

Both *S. gigantea* and *S. sempervirens* produce quantities of seed which grows readily, but the percentage of germination is low, especially with *S. sempervirens.* Very few seedlings are found in the ''Redwood'' forest, probably because the shade is too dense. However, this kind stump-sprouts readily. The ''Big Tree'' forest is more open and young trees of all ages are plentiful. Both trees grow readily in cultivation and have been used in landscape developments where conditions are favorable both here and abroad for many years.

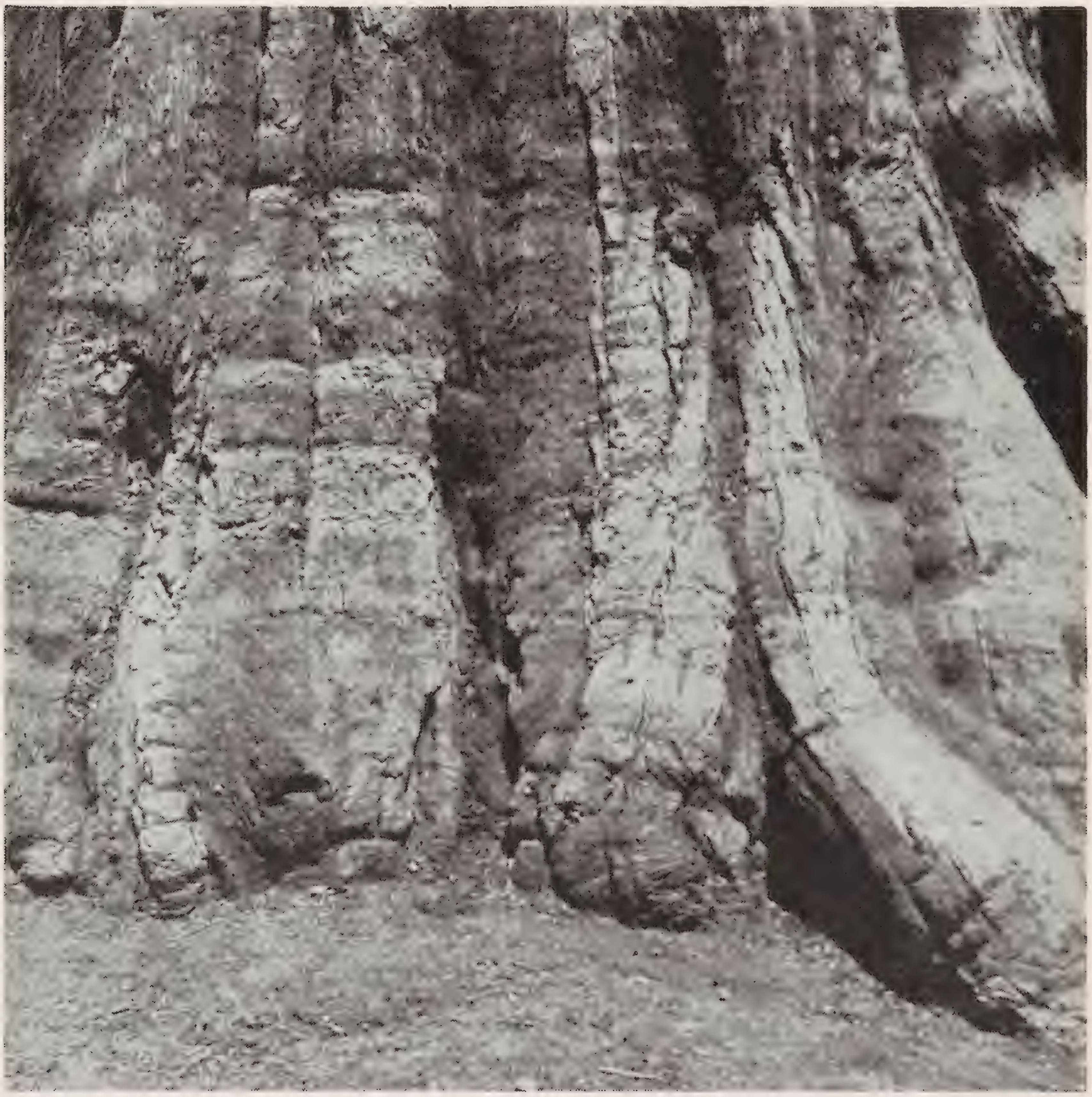

Fig. 28. Base of *Sequoia gigantea* showing ridges and bark texture. Photo—W. M. James.

The age of the Sequoias is difficult to determine, but many calculations indicate an age of 3500 to 4000 years for a ''Big Tree'' thirty feet in diameter. An actual ring count of a ''Redwood'' nine feet in diameter was 2200. In general the "Redwoods" are not considered as old as the "Big Trees."

I first saw *Sequoia gigantea* in its natural habitat in the summer of 1910. An uncle living in the Sierra foothills near Springville took his son and me on a two weeks horseback and pack trip. We started up the Middle Fork of the Tule River and went north on the eastern slope of the first range. Coming back to the western side through a 10,000 foot pass, we dropped down to a grove of "Big Trees" in the southern part of Sequoia National Park. Most of the details of that trip have been forgotten, but the first sight of those famous trees, and the incredible number of felled trees is still very vivid in my memory.

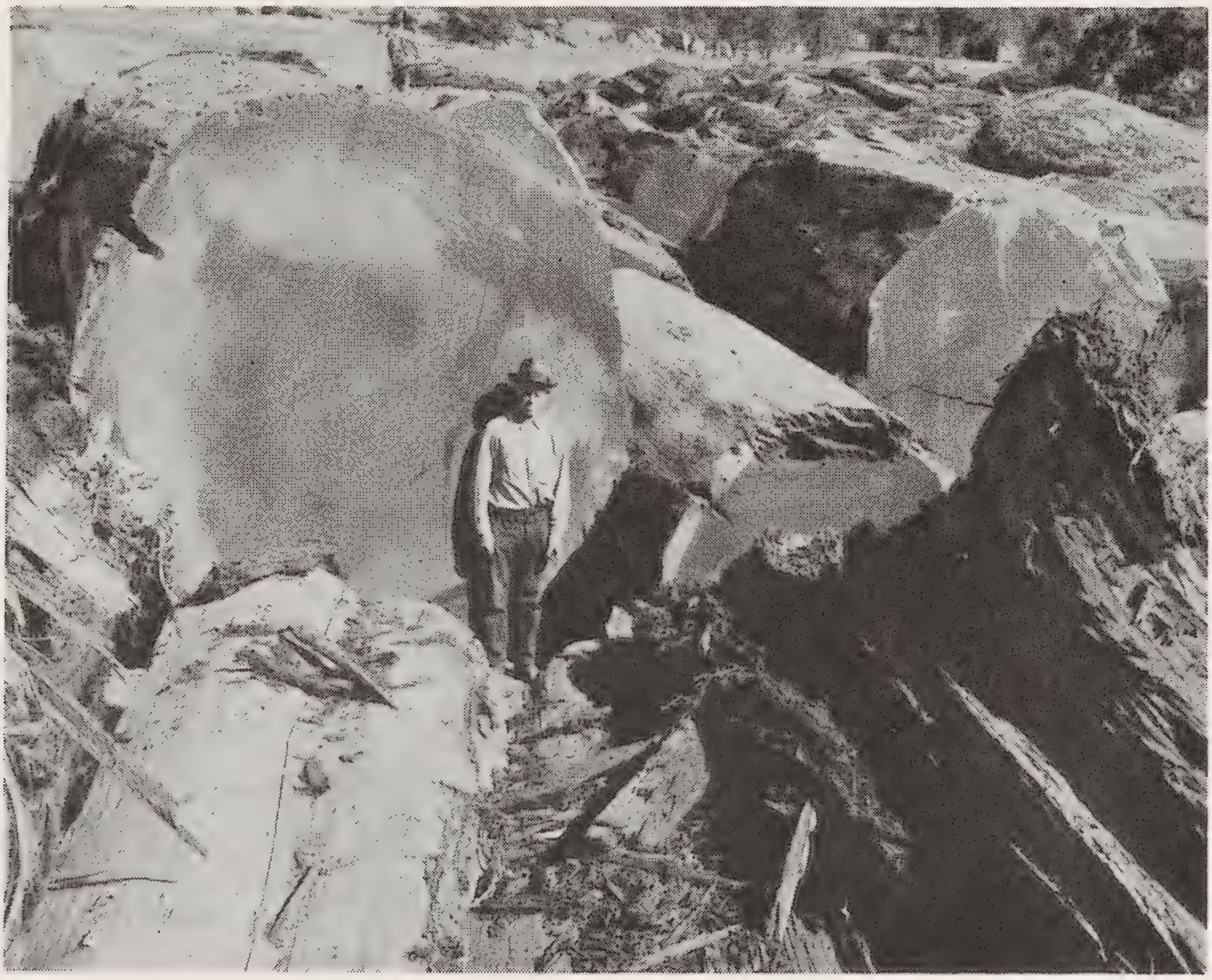

Fig. 29. Relatively small logs of *Sequoia gigantea* brought down from the mountains for milling. Photo—W. M. James.

One of the large trees was still standing on the stump after it had supposedly been cut off from the stump—and it stood that way for many years. It is down now, but I do not know whether a storm blew it over or somebody made a big enough undercut to throw it off balance. Another large tree had been cut and only one short piece taken from the butt end for an exhibit at a National Exposition.

Dry lumber from these trees is relatively light, but growing trees are exceptionally heavy because of the water that they contain. Also the wood is relatively brittle, even more so than that of the Coast Redwoods. When these ''Giant Sequoias'' are felled, they often break up so badly—even though a deep cradle of bark is laid for them to fall on—that very little is left suitable for the sawmill. This accounts for the many trees which I saw lying on the ground. And they do not splinter when they break like other kinds of trees do, but break more like a candy cane does when it is dropped flat on a hard surface. I have since heard that some of these old trees have been split into fence posts and grape stakes, but the dry wood does not split readily.

I visited ''Big Trees'' the next time in the summer of 1943. Starting from Springville, we drove over a fire control and lumbering road to an old sawmill site in another part of southern Sequoia National Park. There were many scattered trees, but no spectacular ones in this area. The Forest Service was doing some thinning, and we were fortunate enough to see a few trees being worked into fence posts and grape stakes. These were the last that were to be cut in that area.

Mariposa Grove in the southern part of Yosemite National Park is an outstanding group and easily accessible. It is a fairly large group in a relatively small area. One of these trees is over the road and has a tunnel cut through it which is large enough for the passage of sight seeing busses. The Grizzly Giant is near this group. It is one of the largest trees, but statistics are of little help in realizing the true size of them. Sixty or seventy years seems a long time to most of us—but some of these trees were a thousand or more years old at the time of Christ.

Another easily accessible group is in the Calaveras Big Trees State Park. This group may have been seen earlier by hunters, but credit for discovering it in 1852 goes to A. T. Dowd. Most of the other larger groups were found at about this time. The tree supposedly seen first by Dowd was felled to provide souvenirs for visitors. It was three hundred two feet high and thirty feet in diameter at the crown. After twenty five days of work, the tree was blown over by a sudden gust of wind while the workmen were eating lunch. Records say that the noise was heard for fifteen miles and that the ground rocked as in an earthquake. The stump was smoothed off and was, and still is, used as a dance floor. In 1854 a tree in this grove was stripped of its bark to a height of one hundred sixteen feet in order that a reproduction of the tree might be erected and exhibited in the Crystal Palace in Sydenham, England. The dead tree is still standing, although fire scarred and with a present diameter of twenty feet.

Probably the best of the trees in Sequoia National Park have recently been made more easily accessible by the opening of a road in Kings River Canyon. I am looking forward to traveling that road and hope that I will be able to recognize some of the first ''Big Trees'' that I have seen.

I haven't seen the so-called Redwood Empire in the northern part of California where the *Sequoia sempervirens* grows in such heavy stands. I hope to visit it soon because I do not see how any one can tire of visiting these trees.

The Santa Cruz Mountains west of San Jose were heavily wooded with ''Redwoods'' at one time. Logging started in this area in 1847 and it was almost entirely cleaned off. Some second growth from stump sprouts is being cut now. Santa Cruz Big Trees State Park and Big Basin National Park are two places that were not cut, and the trees can be seen in all their majesty. The ''Redwood'' is more tapering than the ''Big Trees'' and most of the tops have not been broken out. Winds of high velocity in the Sierra Nevadas have broken the tops out of most of the ''Big Trees''.

One very striking thing about these coastal trees is their habit of stump sprouting. An almost exact circle of trees one foot to one and one-half feet in diameter and in number from a few to twelve or fifteen will be growing around an old weatherbeaten stump five to six feet high and up to fifteen or more feet in diameter. It is almost uncanny to see the regularity of growth and spacing of the young trees in some of these circles. I haven't yet tired of stopping to look at them.

Besides the uniqueness of the trees themselves, they—especially the *Sequoia gigantea*—are found in a geologic wonderland. Not too far from the Calaveras Grove is a formation called Tuolumne Table Mountain. It extends for several miles and was formed by a lava flow filling a stream bed some time during the Miocene period, millions of years ago. This ''mountain'' is partially cut through occasionally by former streams, and in places down to the level of streams crossing it now. It is almost impossible for human imagination to realize the amount and extent of erosion which would cut a plain that was on a level with this mountain top down to the present conformation. And Yosemite with its glacial history never fails to interest people. About opposite Yosemite on the eastern side of the Sierra is a place called the Devil's Post Pile. It is what is left of a large flow of molten basalt which crystalized into long five and six sided columns. This must have been under or very near a glacier, because most of the flow has been completely removed. On one side these long columns have been bent just as a blacksmith would bend a piece of hot iron. The tops of the upright columns are polished as smooth as glass and have scratches from the rocks that were dragged over them. All the gopher mounds in this area are about one-half pumice.

The geologic features in the Coastal section are not as spectacular as in the Sierra Nevadas. The mountains are of sedimentary origin and not as high as the Sierra Nevadas. It is interesting to cross a deep, narrow canyon on a high bridge near the Ocean and feel that you can almost reach out and touch the tops of the tall ''Redwoods'' growing in the bottom.

At Felton, near Santa Cruz, there is a group of low, rounding mountains that are almost pure sand with a shallow covering of soil on top. It is screened for use in plaster, but for all other purposes is used just as it is dug from the mountain. The present size of the excavations is surprising.

And so on. Something different around every corner. Besides all this, along with the Sequoias are found a wealth and variety of flora that have attracted plant explorers and botanists from all over the world for more than one hundred years.

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PROPAGATION OF ARBORESCENT **PHILODENDRONS**

WYNDHAM HAYWARD, *Florida*

The newly popular Arborescent Philodendrons, which comprise a dozen species more or less, previously cited by the author in an article in PLANT LIFE 1954, page 113-16, include several species and hybrids which have become extremely popular with nurserymen and growers for the trade in Southern California and Florida, in recent years.

This increasing popularity has stemmed from the discovery of the generous seeding capacity of these plants, (seed by the thousands can be produced from a single season's bloom on one plant by careful hand pollination) and the acquisition of suitable techniques by growers for multiplying their stocks.

Conceivably, however, in future times, easy methods of vegetative propagation may be desirable and worthy of study and research. Some of the reasons would include the fact that the new hybrids, which are in some ways more desirable and popular than the original species, are of course only obtainable as of the present time from seed. In other words, the original cross has to be repeated every time a new crop of the hybrid seedlings is wanted for propagation. Due to the vagaries of *Philodendron* bloom, weather conditions, cold, frost, rains, etc., it is conceivable, also that in certain years there might be a reduced crop or an inadequate one, of a certain type or types of the hybrid seed produced.

Also the ownership of certain arborescent types and species of the giant Philodendrons is limited to a very few growers, at least in large size plants, of blooming age and suitable for use in hybridizing. Only a comparative few growers in the United States as yet have a stock of old and established plants of the arborescent Philodendrons to assure themselves of adequate annual crops of seeds of the species and hybrids. This has created a windfall of lush business for these few. Little seed is available on the general trade market as yet, and that still expensive. During the summer of 1955 a few advertisements of *Philodendron selloum* seed, the most common variety in Southern California have offered the seed at prices from $15.00 to $25.00 per 1,000 in the trade papers. One thousand seed of *P. selloum* is hardly a rounded teaspoonful, as the seed are comparaticely small, like radish seed.

In good commercial practice, the seed can be sown in flats in the greenhouse or outside exactly like flower seeds, or perennials, like Gerbera or Pansies, preferably under muslin shade, the flats being raised off the ground on benches. The seeds germinate in a few days to a few weeks, and more light should be provided as they grow taller. At one or two inches in height they can be transplanted to other flats or 2-inch pots. In a few months they are big enough for 3 or 4-inch pots and in a year's time have been grown to fives and sixes. All this requires abundant labor, attention, careful watering and protection from cold, rains, hot sun and wind.

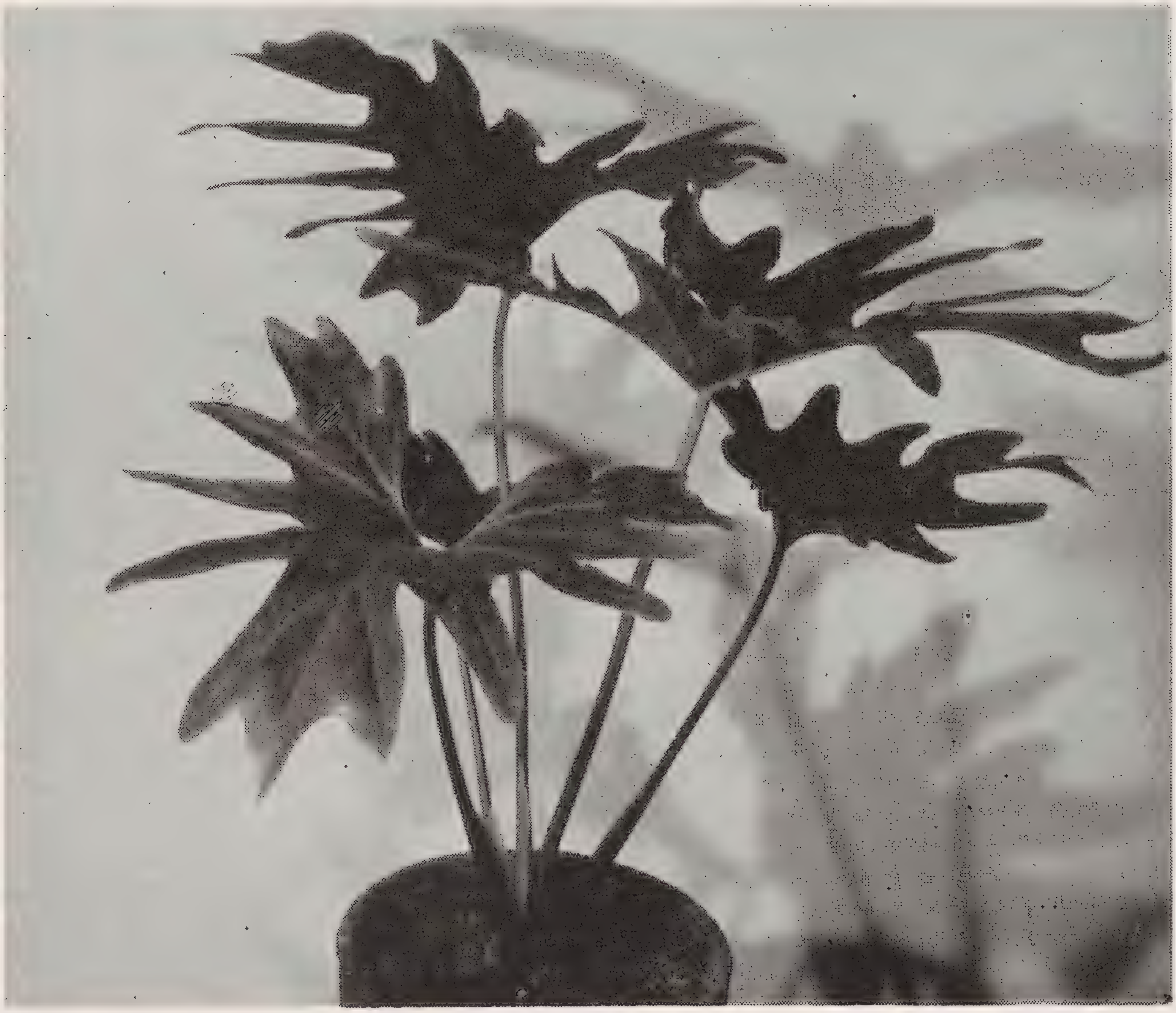


Fig. 30. The hybrid arborescent *Philodendron* x *fosterianum*. Photo—Wyndham Hayward.

By the time the little seedlings are in three or four inch pots they can stand half sun in a lath house and are able to withstand ordinary rains. Heavy downpours may, however, dislodge a few from their pots at this stage. The plants seem healthier when grown in the open air than inside greenhouses, where insects and fungus troubles may occur. Under lath house conditions, with adequate light, and proper spacing, they seldom have troubles beyond an occasional chewing insect, grasshopper or cricket which may eat the leaves.

Once the plants are six inches high and in 4-inch pots they are tough and sturdy and should give the grower little trouble provided he attends to a few simples: adequate spacing, ventilation, occasional feeding with liquid manures or soluble fertilizer, clean or sterilized soil for planting and transplanting as Philodendrons are known to be subject to attacks of certain injurious nematodes (although just what damage this may cause is not yet known definitely), protection from heavy frosts (mature plants of some of the hardier species as *P. selloum* and *P. bipinnapifidum* can take 10 degrees of frost with little damage if in fully dormant condition in winter). Young plants can be severely ''scorched'' by frost and the species *P. undulatum* and possibly *P. speciosum* are known to be tender to all frost and badly damaged when exposed to it.

The vegetative propagation of these Arborescent Philodendrons was the only method of propagation known for them before seeding technique was introduced in 1949 by M. B. Foster. This involved nothing radical and nothing extremely new, as the technique follows in general that of all Aroids, as caladiums, alocasias etc., where the female flowers mature before the male flowers on the same plant shed their pollen. However, the facts of Aroid flowering morphology and hybridization techniques have been mostly well guarded secrets in professional horticultural circles for many decades. Propagators in some cases have been chary of giving out the information to new growers, to restrict competition and to help their own business advantages.

Before seedlings were common, plants of giant Arborescent Philodrendrons were very rare in the United States and perhaps were obtained from plant dealers in Europe at great cost, where they have been grown for generations in botanic gardens and conservatories. *(P. selloum* was growing in the Berlin Botanic Garden in 1850-1855 when first described by Koch.) Or in California once in a while some grower would chop off the tip of an over-all specimen, root the tip in a tub to make a new plant, and dispose of it, for $100 or $200. The base of the old plant would subsequently produce one or two or more suckers, which could be removed and established in pots in the course of time.

In Florida the writer has noted side sprouts or suckers forming on plants in pots and occasionally on those planted in the garden or open ground. There is a report of a grower who obtained a large crop of suckers from a commercial collection of *P. selloum* plants which were hit by severe cold, and while not seriously damaged, being in perfectly dormant state, were severely shocked by the cold. This may have created a systemic or metabolic upset within the plants which demonstrated itself in the heavy production of sucker or offset plants.

Research into the production of such suckers on cold-treated plants would be very worth while at some properly equipped institution.

The writer had half dozen plants of *P. undulatum* in 6-in. pots hit by frost in his lath house in the winter of 1954-55, when they were exposed to temperatures of around 28° to 30° F., for a few hours on several nights. Most of the foliage was killed on the plants or died away in a few weeks. One plant died entirely. Three grew from the old crown and did not produce new sprouts, but two put out side sprouts below the crown as the central bud of the old crown was killed. These sprouts have been separated and replanted in pots, by dividing the old crown with a knife vertically, retaining a few roots with each new sprout. Three sprouts was maximum and the other plant had two. The replanted sprouts are growing rapidly and will make nice plants in another season.

P. undulatum is one of the smallest of the arborescent species, only about three to four feet tall at maturity, and more tender to frost although reputedly native to Paraguay, in Southern South America. The farthest South of this species, whether it extends into Argentina and the most severe climate of its Southern range is worth investigation, and the author would like to hear from any readers having information on these field matters.

In Florida at the present time, vegetative propagation is employed only in a casual and experimental way by the commercial growers. Leading growers such as M. B. Foster of Orlando and John Masek of Apopka (''John's'') are growing these Philodendrons in many thousands from their own and from imported seed.

[Editorial note.—The editor has propagated arborescent philodendrons by severing the stem between nodes thus making cuttings with only one leaf attached. These were planted in a rooting medium of equal parts of sphagnum moss and coarse sand. Up to the present only a limited number have been propagated due to lack of stock to experiment with. He plans to carry out more extensive experiments as soon as stock becomes available.—*Hamilton P. Traub*]

THE MAJESTIC BANANA

Pete Sulen, *Florida*

Anyone can have beautiful banana plants for use in landscaping and as a decorative house plant since they are easy to grow and maintain and have no major enemies under Florida conditions.

When we moved to Florida in 1938, we bought a fish camp. Before long we realized that we needed ditches in which to keep our live bait, but with all the rains we have in Florida, we were faced with the problem of erosion on the banks of the bait ditches. Immediately we started setting out banana plants, spacing them 10 ft. apart and by the end of the second year, so many new shoots had sprung up, they were nearly touching.

Our faithful bananas not only kept our banks from washing away with their interwoven roots, but also attracted tourists from far and near with their majestic tropical appearance and huge stalks of fruit. They were amazed and could not resist taking pictures of the lush growth and immense bunches of fruit, often totaling over 200 bananas per stalk.

Bananas as grown by Pete Sulen, Lady Lake, Florida, along drainage ditches to control erosion of the banks.
Plate 2

As time went on, we kept setting out new shoots as soon as they were rooted well enough, until we now have over 1,000 plants.

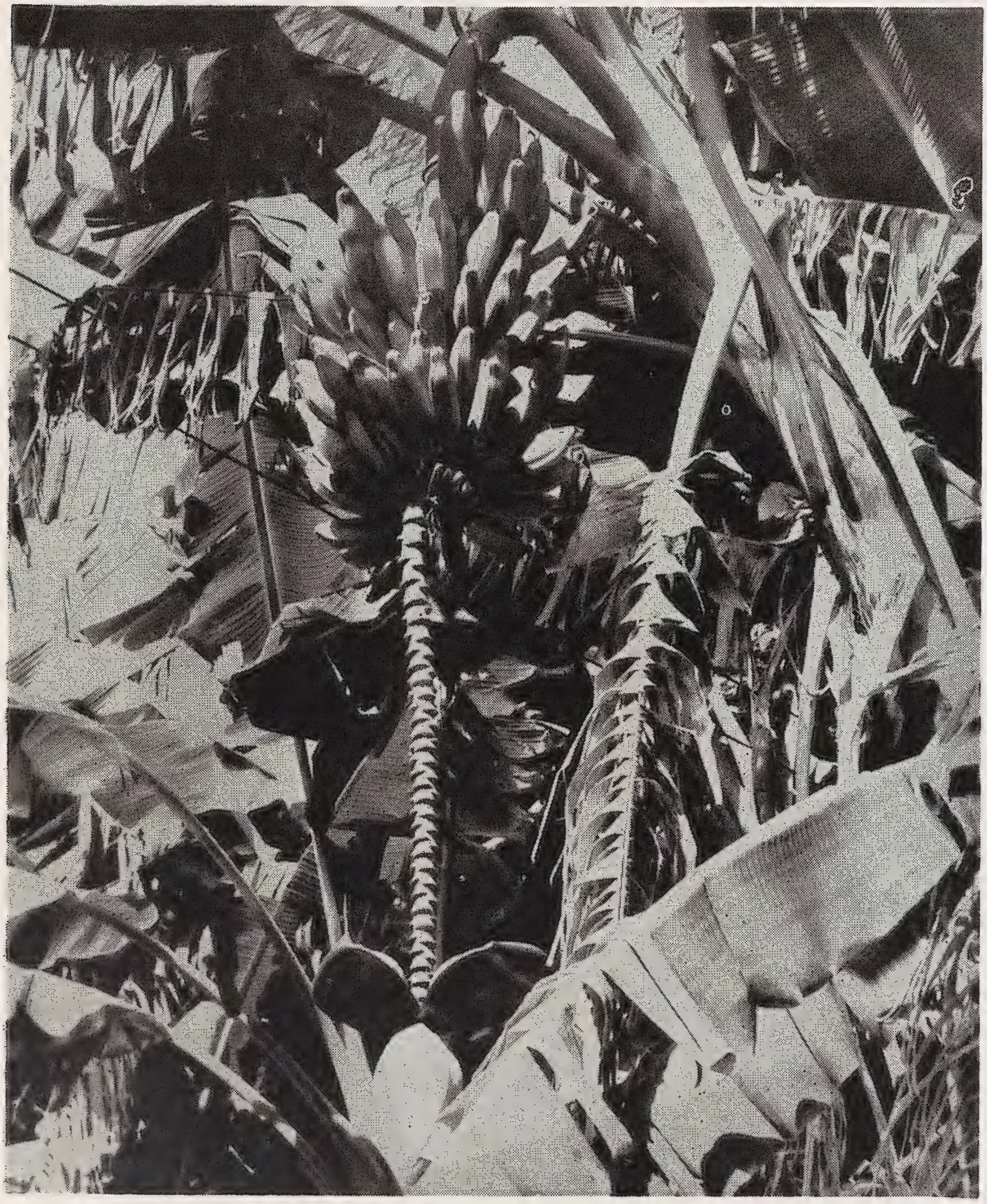


Fig. 31. Fruiting banana plant of the clone 'Green Orinoco'. Photo—Pete Sulen.

CULTURE

In the temperate north, bananas can be grown like cannas—planted outdoors after danger of frost is over, and storing the crowns like those of the canna in the cellar or other frost-free place during winter. Bananas may also be brought indoors in winter to be used as an attractive pot plant. 'Cavendish' is one of the best clones for growing under glass, and it will fruit in the northern states. Its short medium sized height requires only modest overhead space, and it will mature fruit from time of planting several months sooner than other clones.

Bananas can also be grown outdoors in protected areas in the Gulf Coast, Southern Texas, Southern Arizona, Southern California and Southern and Central Florida.

The banana is of easy culture and a soil and fertilizer suitable for an Irish potato should meet its requirements very well. Plenty of organic nitrogen, animal manure, leaf mold and mulch of all sorts in addition to an abundant supply of water are required for light soil. The banana is a very cooperative plant, rewarding the owner with its offspring (offsets) and delectable fruit at a rapid rate.

CLONES

There are several banana clones under culture here but the most delicious is 'Cavendish' with a medium sized plant. When fully ripe, the flavor is very mellow and delicious and the skin is very thin. The plants reach a height of 6 to 8 ft.; have extremely wide leaves, often over 2 ft. wide and make excellent landscaping and patio plants.

Another clone is 'Lady Finger', which attains a height of from 12 to 15 ft. and doesn't have as wide leaves as 'Cavendish'. The fruit lives up to its name, small and dainty like a lady's finger and has exceptionally thin skin, even thinner than in 'Cavendish'. The flavor is similar to that of 'Cavendish'. Other clones grown here are 'Red Banana' and 'Gros Michel', and also one of the Plantains.

'Green Orinoco', the tallest of all clones often reaches a height of 20 to 25 ft. Its towering height, graceful sweeping leaves and great stalks of fruit give it a most dignified and stately appearance. The fruit from this clone has a slight apple flavor.

In conclusion, anyone with a natural love of growing plants can raise the majestic banana with gratifying success.

[Editorial note.—Those interested in banana culture should write directly to Pete Sulen, Griffin View Fish Camp, Lady Lake, Florida.]

CALIFORNIA VACATION TRIPS, 1955

WILFRED McD. JAMES, *California*

Leaving Sarasota our route was over Pacheco pass into the San Joaquin valley down to the first stop at Fresno to collect some seeds. The bare, brown, almost treeless hills on the eastern slope are just as interesting in the fall as they are in the spring when covered with green grass and patches of yellow mustard, poppies and lupine.

The next stop was overnight at Springville, in the Sierra foothills east of Porterville. There is a sawmill there. It was really fascinating to watch an eight foot pine log end up in a pile of lumber. It is almost uncanny the way one of these heavy logs is moved around on the saw table.

There is always strife between the log haulers and road-law enforcement officers. The truck men claim that they can not make a profit hauling an overload and the officers know that the overloads break up the roads. In this locality very large trucks haul a load up to seventy tons from the logging camp to the public road and dump it. Even though there is a stream of water running on the truck brake bands, the lining has to be replaced about once a week.

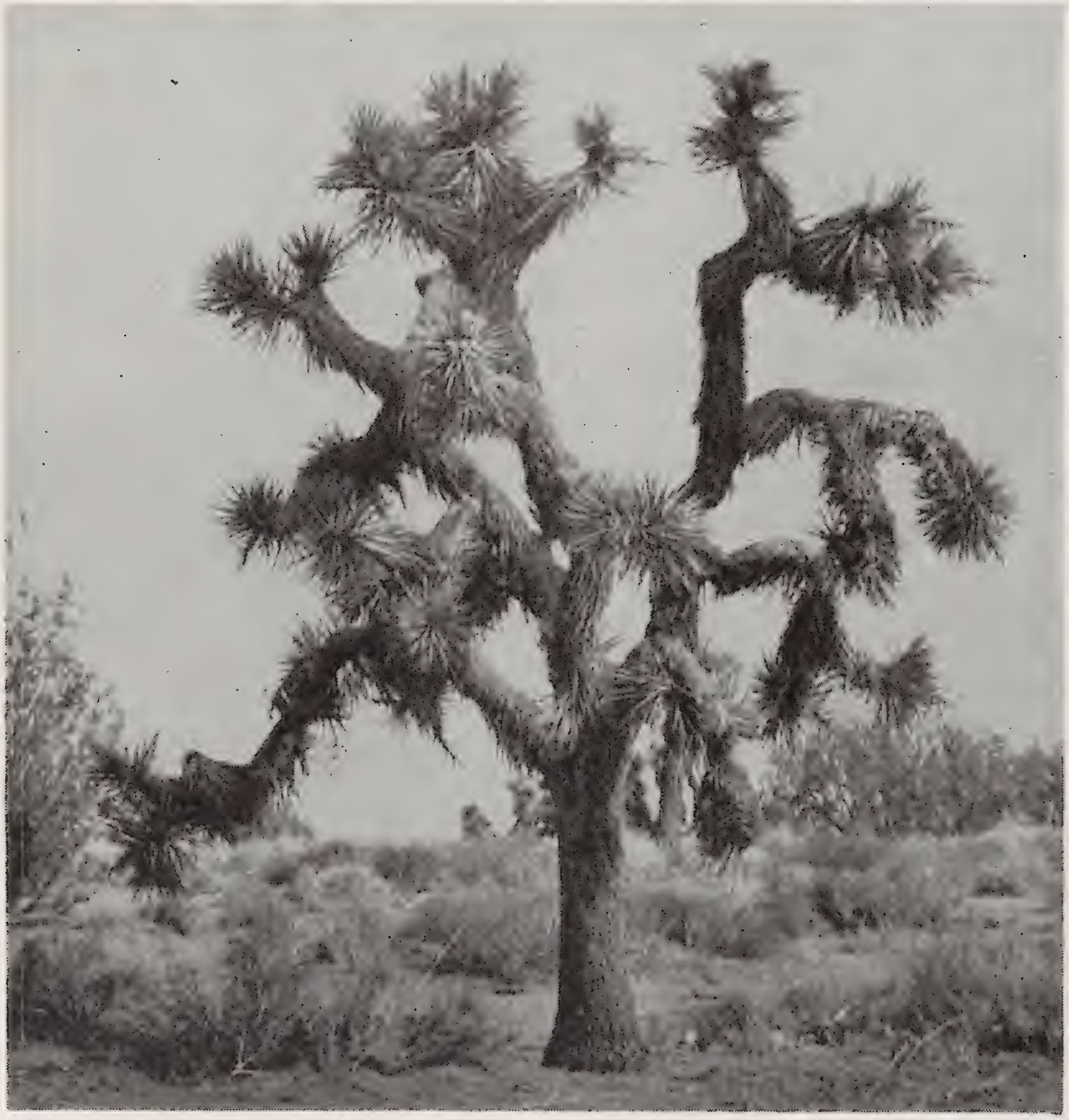


Fig. 32. *Yucca arborescens (Cleistoyucca arborescens),* old Joshua Tree with juniper bushes in the background. Photo—W. M. James.

The logs are then loaded onto smaller trucks for the trip over a public road to the sawmill. This place is called a reload station and no logs can be brought in from the logging area after the winter weather starts because of ice and snow on the roads. They can haul to the sawmill until the stock pile is used up. The men here told us an interesting "redwood" story among other things. The cutting is being done on private property. The mill needed some redwood lumber, so they decided to cut the last *Sequoia gigantea* that was on the property. Rather elaborate preparations were made with bull-dozers to provide a cradle for the tree to fall in that would reduce the possibility of breaking when the tree

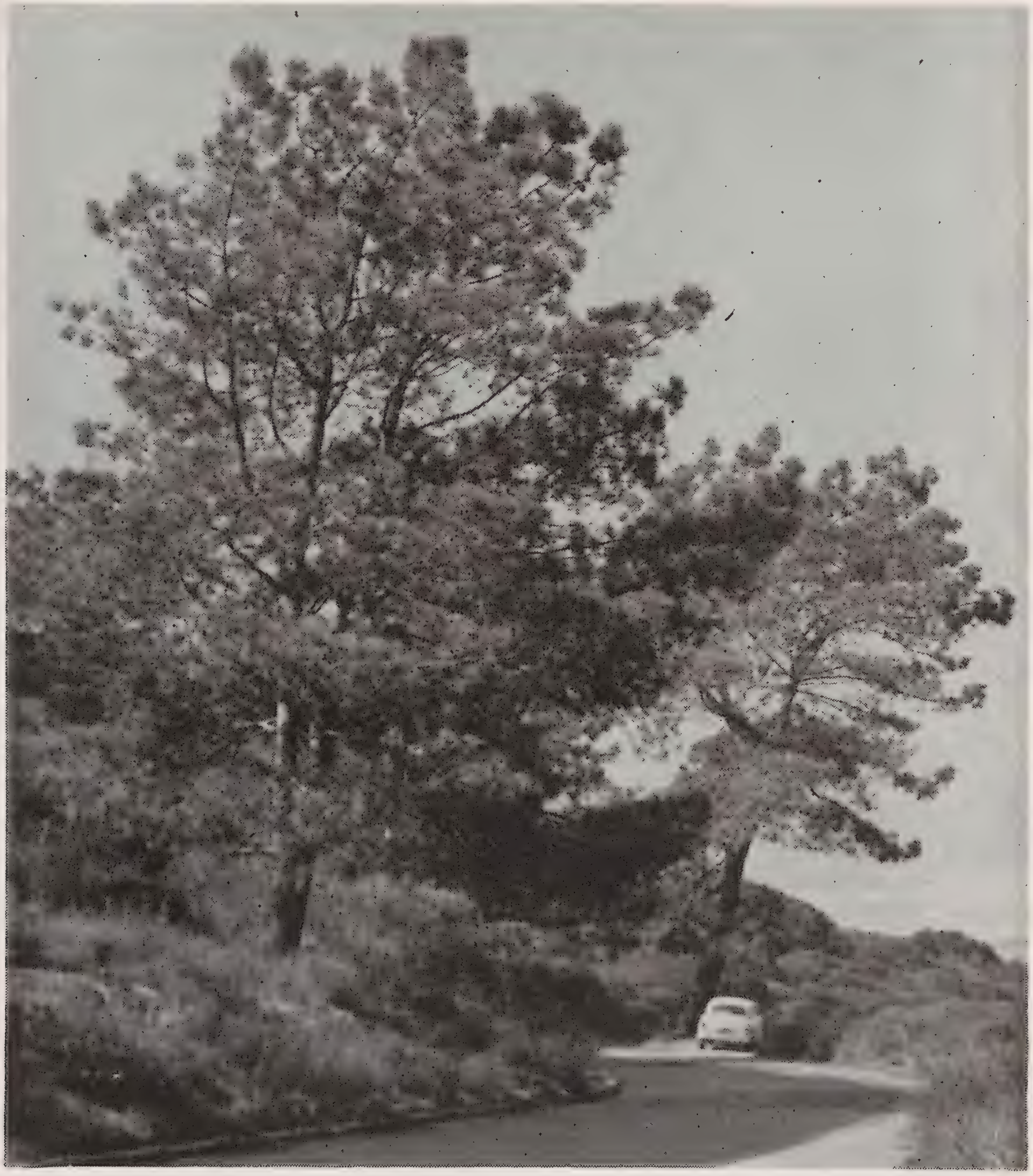


Fig. 33. Fine specimen of *Pinus torreyana* alongside old highway where it leaves the seashore. Breakers are dimly visible in the background. Photo—W. M. James.

fell. Somebody miscalculated and the tree fell in the wrong direction. It completely flattened a cabin and broke up so badly that they couldn't get any saw-logs out of the whole tree.

Our next stop was at Fort Tejon, near the town of Lebec on the Ridge Route between Bakersfield and Los Angeles. This fort was established in the early eighteen fifties and maintained about ten years to protect Amerindians in the vicinity. The nearest source of supplies was quite distant over a rough terrain with a hot dry climate with very little water available. A herd of camels was brought from Arabia to facilitate transportation. It was a failure, principally because the soldiers could not handle the camels. The State of California has purchased this area for a Park and is restoring the old adobe buildings of the Fort. There is a grave here marked "Peter Lebec, killed by a bear in 1837." The soldiers of the Fort had trouble with bears stampeding their horses. It isn't exactly botanical, but a book by Harry Carr, "The West is Still Wild," gives a very interesting account of the Southwest in the older days.

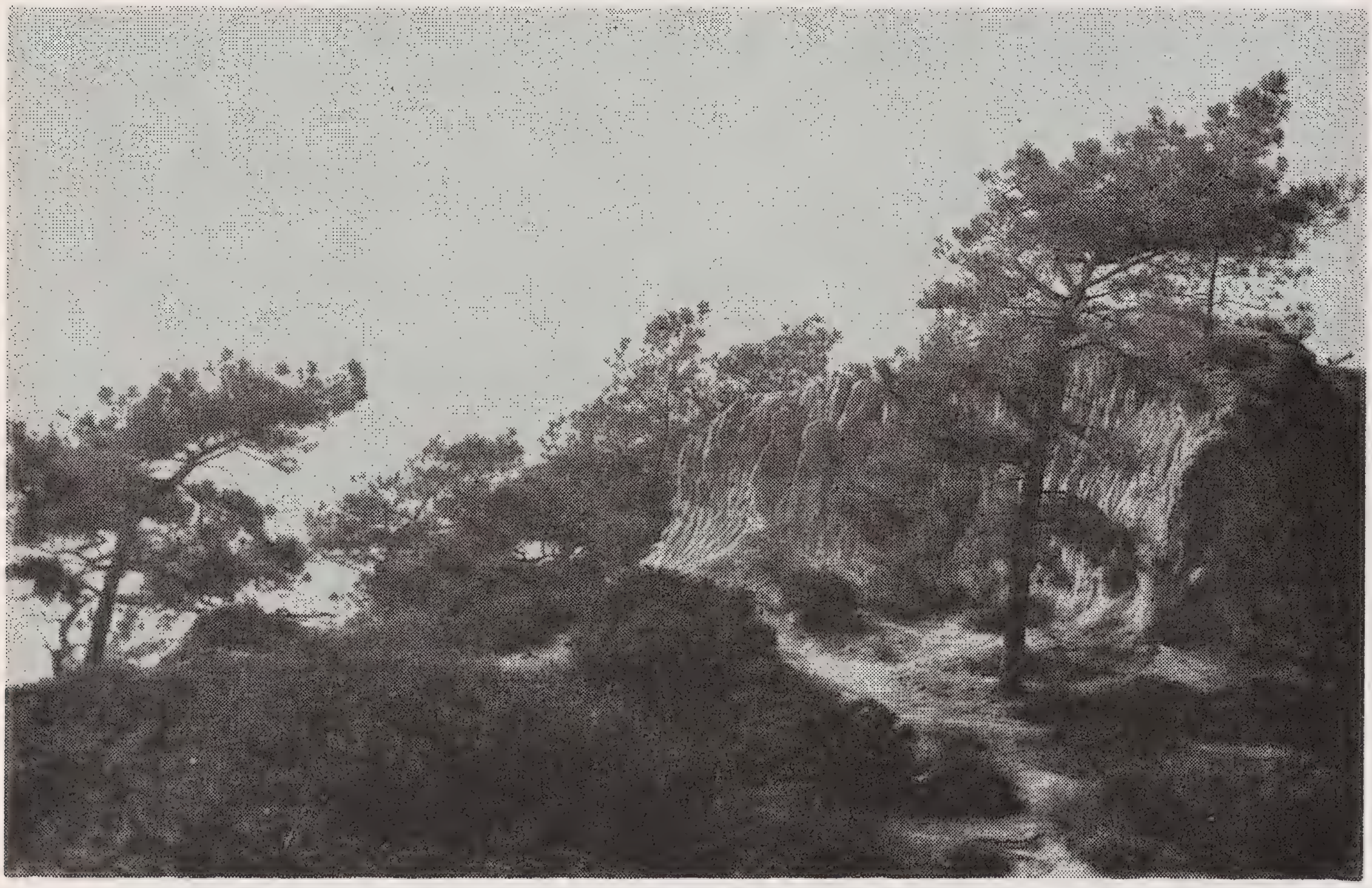


Fig. 34. *Pinus torreyana* showing effects of summer trade winds from Pacific Ocean. Erosion is typical of that found wherever softer strata are exposed. Annual rainfall is about 8 inches. Photo—W. M. James.

We took a side road to Lancaster instead of following the main road over the Ridge Route to Los Angeles. This follows the western edge of the Mojave Desert. The principal vegetation is Joshua Trees and Juniper bushes. We were sorry to find this land being cleared, mile after mile of it. Water is pumped from deep wells and good crops are grown on the very fertile land. There is a National Monument of Joshua

Trees east of Coachella Valley, but it is not as accessible for many people as this area. It is depressing to see these picturesque trees pile up in front of a bull-dozer.

The Joshua Tree (Fig. 32) belongs to the Agavaceae. It has been known as *Cleistyucca arborescens* and *Yucca arborescens.* Jepson (Silva of California) favors *Yucca brevifolia* Engelmann. It is a tree twenty to thirty feet high with an open crown of arm-like branches. The flowers are greenish white. The stem does not branch until after the first flowering. It is densely covered with stiff spiny serrate leaves all of which point upwards. After the first flowering and on later branches, the old leaves die, turn outwards and downwards, falling off in one or two years. New branches start from lateral buds beneath the terminal flower bud. These branches grow irregularly and give the Tree a grotesque appear-

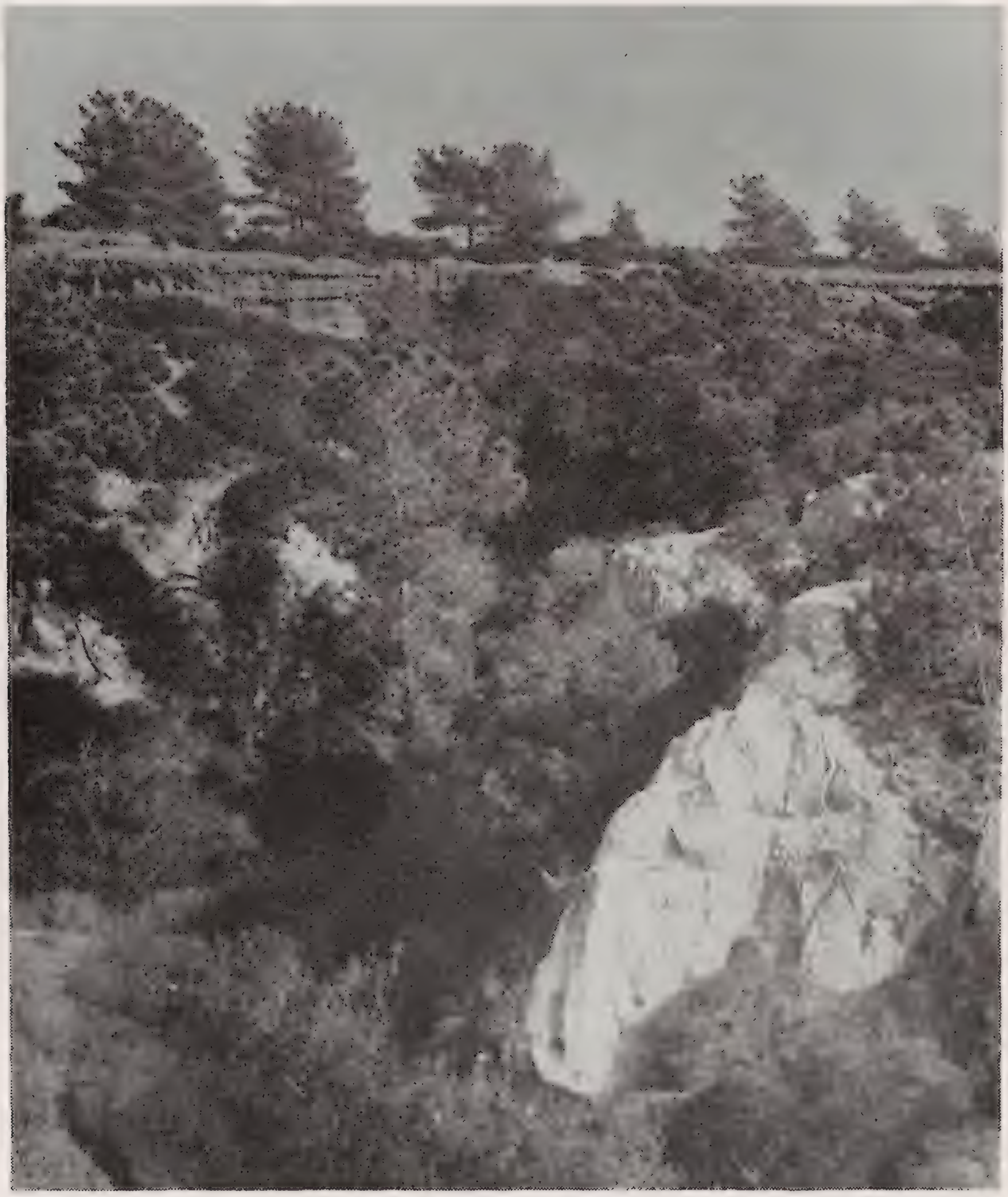


Fig. 35. *Pinus torreyana* in a steep barranca (deep ravine) which leads down to the Pacific Ocean. Photo—W. M. James.

ance. The Joshua Tree is dependent upon a certain moth for fertilization of the flowers, like many of the other Yuccas. The moth works at night gathering a ball of pollen. She then flies to the flower of another plant, deposits her egg in the ovary and then climbs to the style and pushes the pollen ball down inside the stagmatic tube. The larva destroys many seeds, but there are generally quite a few good ones left.

Juniperus californica Carr is a shrub or small tree much-branched from the base and growing two to even thirty feet high. It is common in dry areas from four hundred to four thousand feet elevation. It adds to the attractiveness of the landscape and the wood is used for fuel and to some extent for fence posts.

I was much impressed with the outstanding plant collection at Mr. Barry's Tropical Plant Nursery at Los Angeles. Dr. Stoutemeyer, of the University of California at Los Angeles helped make our Los Angeles trip enjoyable by showing us the old Vavra Estate and the Arboretum at the University.

And then on to La Jolla to visit Dr. Traub. If one can spare just a little time, there are many points of interest to investigate along these California roads. For instance there is Dana Point where dried cow hides were tossed over the cliff to be picked up by sailors and lightered to a sailing vessel anchored off-shore. It is named after Dana, who wrote a detailed account (Two Years Before the Mast) of the two year trip of a sailing vessel going around the Horn for a cargo (mostly cow hides) from California. Except for short, detailed accounts of the handling and management of a sailing vessel under various conditions, the story is very interesting and informative of the earlier days.

A little south of Del Mar, near the mouth of the Soledad River we find the Torrey Pines. The trees are relatively small and are interesting mainly because of their isolation. They are found only on the eastern end of Santa Rosa Island (Santa Barbara Channel Islands) and from Del Mar south about eight miles and inland about one and one-half miles. *Pinus torrevana* Parry (Figs. 33, 34 and 35) is mostly fifteen to twenty feet tall with widely spreading branches forming an irregular crown. The cones have a peculiar, roundish shape.

The old Highway is kept in good condition and although it is steep and narrow, the route is through the middle of the area where these pines are growing and is well worth traveling, with occasional stops and short walks to look around. The main grove of *Pinus torreyana* is owned by the City of San Diego and is maintained as a Park. The trees should thrive and exist indefinitely in this protected natural reserve.

A visit with Dr. Traub is always interesting and informative. He is just getting all the plants in the ground and likes the new home very much. And it was pleasant visiting Dr. Whitaker, who is in charge of the U. S. Horticultural Station near La Jolla.

A short stop in Santa Barbara found Mr. and Mrs. Orpet in good health. He is not quite as "young and supple" as he was once, but his memory and interest in plants is just as keen as ever. And it is always pleasant visiting with Mrs. Orpet.

And then on home to find fall is definitely here with the Toyon berries on the hills turning red and the Madrone fruits just about ready for the birds. And they really take advantage of them. I have been reading about and looking at the Southern half of California for several years, but there seems to be always something new and/or interesting "Just around the corner."

HELICONIAS INVADE FLORIDA

WYNDHAM HAYWARD, *Florida*

The addition of several species of *Heliconia* to the garden flora of Central and South Florida in recent years has been greeted with enthusiasm by those horticulturists who esteem the strange and exotic in tropical and sub-tropical ornamental plants. The Heliconias have been known in the state to a limited extent for 25 years or more, but little attention was paid to them because they seemed temperamental and not reliably hardy.

Now, however, at least one species, *Heliconia latispatha* Bentham (Fig. 36) is a striking visitor to Central Florida gardens in the vicinity of Sanford, Orlando and Winter Park and will bloom well after warm winters, warm enough so that the stems are not cut down. Being members of the banana family, the Musaceae, the Heliconias are tender, some of them ultra-tropical and possibly hopeless except in the most frost-free areas of south Florida, but others are beginning to show what they can do as ornamentals from Miami North for 300 miles or so.

Recently the Fairchild Tropical Garden at Cocoanut Grove has acquired a collection of Heliconias, and there have been articles in the Miami newspaper garden pages about *Heliconia humilis* Jacq., with its showy red bracts. *H. humilis* is reported native from Trinidad to Brazil. *H. latispatha* is found in Central America, Guatemala, Panama and also Columbia. Mulford B. Foster, the plant explorer of Orlando, Fla., reports the most sensational and gorgeous species of *Heliconia* that he has encountered are in Colombia, many of them apparently unknown to botany, at least with any certainty.

The species *H. latispatha* is the only one to date which can be recommended for general planting in the Central Florida garden and around the Gulf Coast in reasonably protected places. While some Heliconias are fatally stricken by even a breath of frost, *H. latispatha* will endure temperatures down to 30 degrees for a short time with only slight injury to the giant banana-like foliage. If the four to six-foot leaf stems are not injured by the cold, the plants will bloom the following summer. This occurred in 1953 and 1954. The severe cold of the 1954-55 winter froze down most *Heliconia* stalks of whatever species, and few blooms have been observed in the summer of 1955.

The Heliconias range from a small species like *H. psittacina,* one of the tender beauties of the genus, which is only two or three feet tall at blooming, with odd crabs-claw-like orange flowers, to giant species with huge pendant inflorescences several feet long, which look like boiled

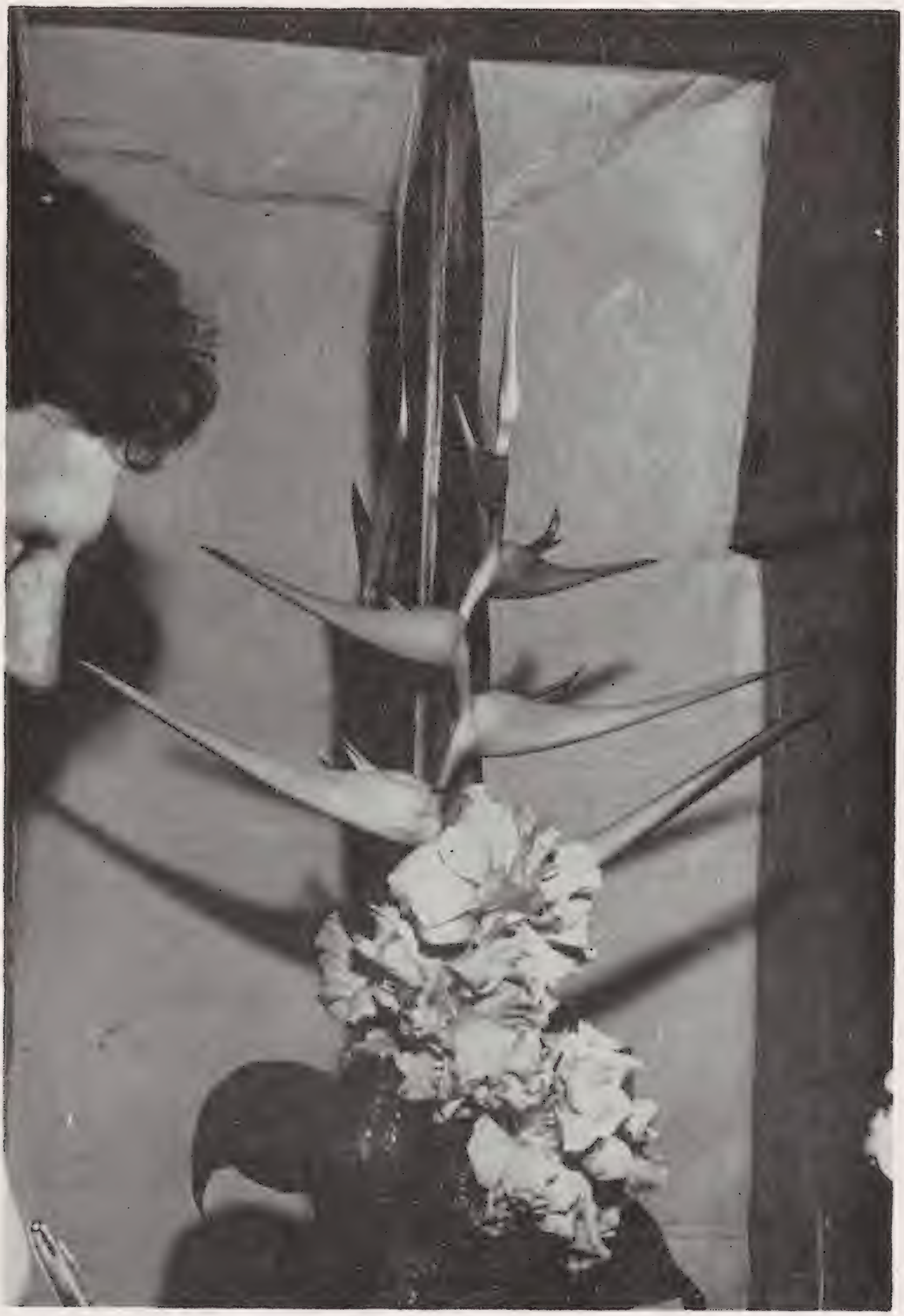


Fig. 36. Flower stem of *Heliconia latispatha* in flower arrangement by Mrs. Leonard Toy. Photo—Wyndham Hayward.

lobster claws hung on long stems. "Lobster Plant" is perhaps their most popular name.

The leafy stems are stiff but slender, like those of *Alpinia,* and the inflorescence is terminal, upright in a few species, as *H. latispatha,* and pendant in the most showy of the tropical forms. In Hawaii, where frosts do not occur outside of the mountain tops, the Heliconias are common, and are called "False Bird of Paradise" according to Kuck and Tongg in "The Tropical Garden." In Hawaii's favorable climate they grow a dozen species, among them *H. aureo-striata, H. elongata, H. humilis, H. latispatha, H. metallica, H. littoralis, H. psittacorum, H. collinsiana, H. spectabilis, H. illustris, H. aurantiaca,* etc.

Most of the species are tall plants, the stems rising out of the ground and renewing every two or three years. Sprouts arise from rhizomes and stolons at the base, soon forming a large clump. In full shade and when well fed and watered the plants become higher than is advantageous. They seem to thrive on about 50 per cent shade and sun. The flower stalks and the bracts and sheaths are the showy part of the "flower" or inflorescence, as the true flowers are usually quite hidden in the angles of the sheaths. The leaves may be seriously whipped by winds and should have protection from that injury as well as the cold. Otherwise they are almost foolproof once they find a place to their liking. Propagation is by seed and root divisions. The seeds of *H. latispatha* are blue-black like certain Amerindian corn grains.

H. latispatha, the only species which has made itself at home in Central Florida, has orange reddish colored spathes and rachis or stem. The stalk goes straight up and the long boat-shaped bracts point out horizontally in stop-like regularity, first one side, then the other, a few inches apart. The top of a large inflorescence and leafy stem may rise to 10 feet above the ground.

Popular and common species in the West Indies and South America, widely spread, are *H. caribaea* and *H. Bihai.* The name *Bihai* was given to the genus by Plumerius before the time of Linnaeous, who assigned *Heliconia* to it in 1771 in his Mantissa, II, page 147. The genus is part of the subfamily Heliconieae of the Musaceae and the standard monograph is by Dr. K. Schumann, in Das Pflanzenreich, Heft 1, Part IV, 1900. At that time Schumann accepted 29 species and at least that many more have been recorded in the Index Kewensis since.

One of the curious situations in the Heliconias is that there are several East-Asian species recorded, or rather Oceanic, including the Dutch East Indies. These were grouped under *H. Bihai* in the monograph by Schumann, although found in New Caledonia, the Solomon Islands, Samoa, New Guinea and the Moluccas. But the most recent student of the Heliconias, Irwin E. Lane, now on Fulbright scholarship in Europe for botanical research into the genus, reports there are "at least five distinct species in the old world."

Mr. Lane, through the kindness of the Smithsonian Institution and the Gray Herbarium of Harvard, who are cooperating in his studies, made the identification of our Central Florida species as *H. latispatha,* which Mr. Foster says has been hanging around in our gardens without a name for 25 years! Lane reports it is a common species throughout

Central America and possibly into South America. He explains that *H. latispatha* is found in color phases, ''both of solid red or yellow, and red or yellow with the other color on the margins and tips of the spathes. Our *H. latispatha* plants in Winter Park have red markings or edgings on the orange-yellow spathes.

R. G. Wilson of Miami, a commercial rare plant grower, reports he has the reddish strain of *H. latispatha* under the name *H. distans,* and he cites others of the hardier types as *H. angustifolia* (?) and one called *H. rostrata* which ''stands cold well.'' These are all worth further garden study in the lower South.

AMARYLLIS AND BULB SOCIETY SHOW, 1955

Mrs. Louis J. Wyler, *Louisiana*

The 8th Annual Flower Show of the New Orleans Amaryllis and Bulb Society was held at the home of Mrs. John J. Palmisano, 1928 Pine Street, New Orleans, Friday afternoon, April 1, 1955. Awards were made in the following classes—Artistic arrangements, horticulture Division (Amaryllis); Louisiana Iris; Bearded German Iris; Calla (Zantedeschia); Tulips; Scilla; Oxalis; Ranunculus; Lily-of-the-Valley; Gladiolus. Mrs. Felix Coltraro won the tri-color award in artistic arrangements, and Mrs. Henry Irion the tricolor in horticulture. Mrs. Louis J. Wyler received two awards of merit in artistic arrangements for her driftwood-amaryllis arrangements, and two awards in horticulture, including the sweepstakes for having the most specimens in the show—being a nationally accredited flower judge, she did not compete officially.

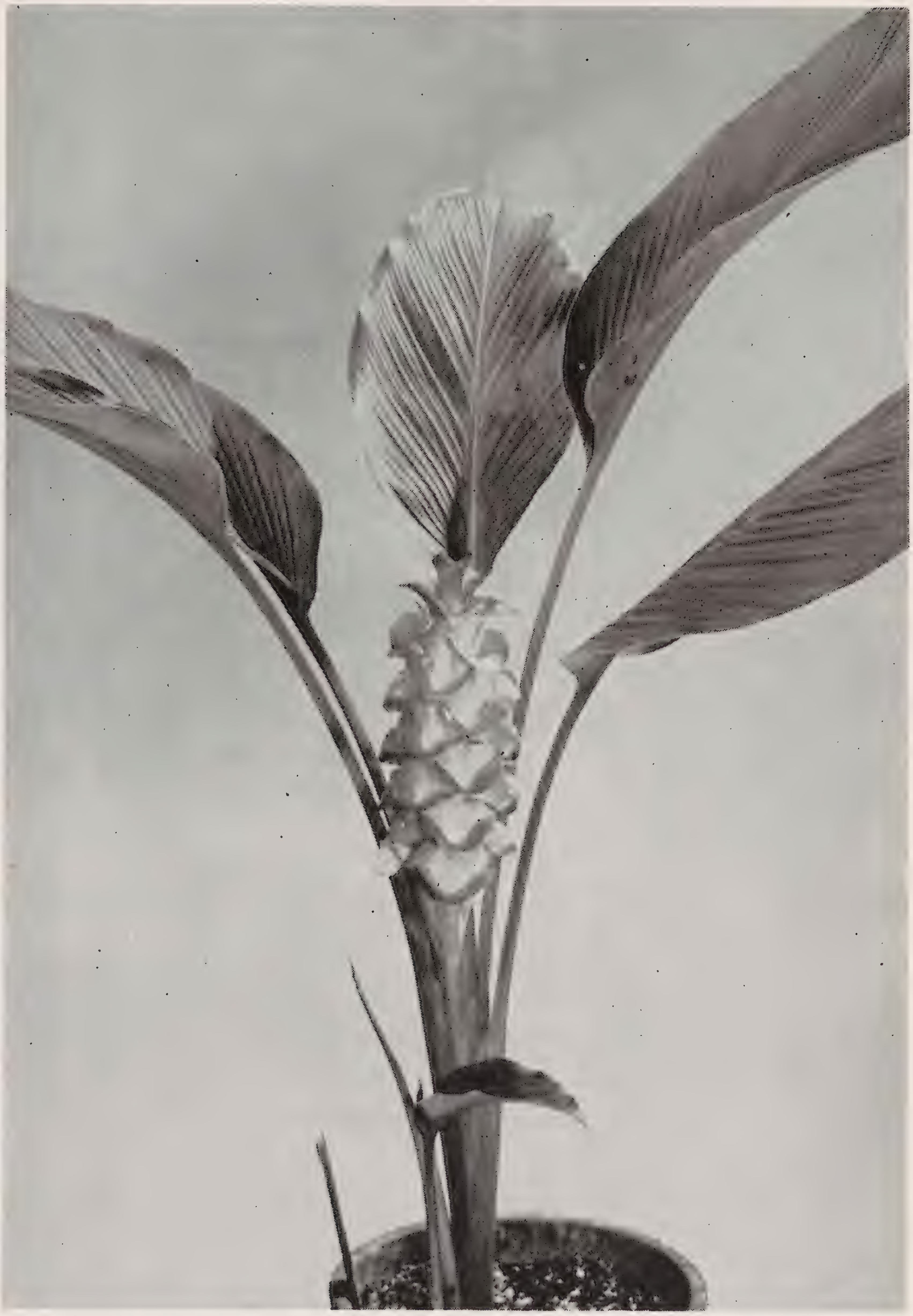
THE TERRA-COTTA CURCUMA, **C. ROSCOEANA**

Wyndham Hayward, *Florida*

The species of ''Ginger Lily'' we are considering in this piece is one cited as ''Mr. Roscoe's Curcuma'' in the Botanical Magazine where it is illustrated and described under Plate No. 4667, dated Sept. 1st, 1852, making this handsome pot species no novelty to the horticulturist that knew his way around 100 years ago.

Actually it had been described previously by Dr. N. Wallich, in his Plantae Asiaticae Rariores Vol. I, page 8 Plate 9, a very rare and hard-to-find work of 1830 describing numerous choice Eastern subjects which were new and outstanding at the time.

The plant was discovered in the Irriwaddi section of India, the place name being Syon, near the habitat of the better known ''Queen Lily,'' *Curcuma petiolata,* known as the orchid-pink ginger. *C. roscoeana* was named in honor of W. Roscoe, another famous East Indian botanist



The Terra-Cotta *Curuma roscoeana* as grown by Wyndham Hayward at Winter Park, Florida. Photo—Shockley.
Plate 3

and plant explorer of the time. The exact habitat of the plant is stated as ''Pegu, and the coast of Tenasserim.'' Those acquainted with the Indian scene will be able to place this better than the writer.

At Syon it is said the plant flowers in July, and here at Lakemont Gardens the showy spike of terra-cotta-colored bracts rises in the midst of the leaves in August and September. It seems to bloom later in pots, than when grown in the ground. It prefers a light sandy but fertile loam and good drainage, also half shade is essential. A few tubers that were planted on moist mucky beds which are eminently suited to *Curcuma latifolia, C. zedoaria* and *C. petiolata,* were a miserable failure and most of them lost entirely.

The plant in the photograph was grown in a six inch pot, the small rhizome planted about May 1st and the bloom appearing in August and September 1954. The bloom spike lasts in good condition for weeks. The entire plant may be two feet tall at optimum to the top of the leafy stem, usually less. The spike on large specimens can be eight or ten inches tall with many bracts, in the form of the typical *Curcuma* pockets or pouches. The color appeals to all who see it, and women are enchanted with the color of the flower spike when used as decor for a ''Chinese room.''

Unlike other Curcumas, *C. roscoeana* is not difficult to bloom. In fact it never fails with any kind of good culture, even from a small piece of tuber. The large size tubers of this species are about as large as a big English walnut, with one or two small side rhizomes which can be removed at planting and potted up separately. The writer knows of no other species of *Curcuma* so sure and easy to flower for the amateur, and so showy when in flower, considering the size.

A potting soil of one half sifted carex peat and one half coarse building sand, with a small amount of rotted cow manure added, suits them admirably in lathhouse or greenhouse culture. After blooming the plants go dormant in winter and are repotted in spring. The writer does not recommend growing them in the garden until roots are available in greater quantity at a lower price. At present the small rhizomes bring $3.00 each even in Holland where the grandparent rhizome of the plant in the photograph originated. It is one of the desirable treasures buried in the text of the Van Tubergen bulb catalogue.

The bloom of this *Curcuma* species is terminal, borne at the center of the sheathing leafy stem. *C. petiolata* is similar, but the spike on *C. roscoeana,* while not as large, shows up better against the leaves than the other. The leaves are a foot to a foot and a half long, with gentle plaiting effect. The hollow of each orange bract contains two or three flowers, bright yellow and scarcely showing over the top of the bracts. The plant in bloom is striking and even at the leafy stage only, is a handsome specimen. The orange spike when cut makes a showy centerpiece for a flower arrangement and several of them in a bowl will be a conversation piece for a diplomatic dinner. They can be cut with two or three leaves attached, without injuring the plant materially.

PLANT LIFE LIBRARY

VEGETABLE PRODUCTION, by Paul Work and John Carew. 2nd ed. 1955. John Wiley & Sons, 440 4th Av., New York 16, N. Y. pp. 537. Illus. $4.72. This second edition of a standard text for schools and colleges has been designed as an introduction to vegetable production and marketing; its content is grounded on the principles of basic science and is illustrated from practical operations. The first 15 chapters are devoted to general considerations of crop production and marketing, and the rest of the book to the major vegetable crops. This stimulating text is highly recommended.

PRACTICAL HORTICULTURE, by J. S. Shoemaker and B. J. E. Teskey. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1955. pp. 374. Illus. $4.20. This easily readable text on the culture of ornamental trees and shrubs, vegetables, flowers, fruits and other plants has been written for students of vocational agriculture, and to ''meet the needs of gardeners for a reference text and guide to the how, when and why of horticultural operations.'' Highly recommended.

SOIL FERTILITY, by C. E. Millar. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1955. pp. 436. Illus. $6.75. This book on the interrelationships of soils and growing plants has been written for students taking a course in soil fertility and as a reference book for students in soil-management courses. The author's main objective is to ''deal with fundamental principles that can be applied to crop-production problems when local conditions are taken into consideration.'' This text by an outstanding authority is indispensable for students in the fields indicated.

LIFE SCIENCE, by T. S. Hall and F. Moog. John Wiley & Sons, 440 4th Ave., New York 16, N. Y. pp. 502. Illus. $6.50. This refreshing introductory college text of general biology emphasizes the efforts of observation, speculation and verification through which biologists enlarge the understanding of living organisms. Man appears as a representative type, or as an important agent in the biological situation in the chapters on nerve and organ physiology, and in limited sections on genetics, immunity, evolution and ecology. This stimulating book is highly recommended.

GENETICS AND METABOLISM, by R. P. Wagner and H. K. Mitchell. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1955. pp. 444. Illus. $7.50. This outstanding text has been written mainly for advanced undergraduate or beginning graduate students of genetics, biochemistry or microbiology. The purpose is to bring together facts and ideas from the fields of genetics and biochemistry, and to some extent also from those of physiology, cytology and embryology, in order to synthesize a general outlook on the biochemical basis of inheritance. Highly recommended.

EMBRYOGENESIS IN PLANTS, by C. W. Wardlaw. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1955. pp. 381. Illus. $7.00. Dr. Wardlaw has performed a genuine service in bringing under one roof the results of extensive researches in the field of embryogenesis in plants. The rest of the book is concerned with detailed discussions of embryogenesis in Algae, Bryophyta, Psilotales and Equisetales, Lycopodineae, ferns, gymnosperms and flowering plants. This stimulating book will appeal to botanists, teachers and research workers.

PHOTOSYNTHESIS, by R. Hill and C. P. Whittingham. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1955. pp. 165. Illus. $2.00. This brief account of the biochemistry and the physiology of photosynthesis was written to provide an introduction to present researches in this field. It is a stimulating book which is indispensable to students of plant science.

ELECTROCHEMISTRY IN BIOLOGY AND MEDICINE, edited by T. Shedlovsky. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1955. pp. 369. Illus. $10.50. This book is based on a symposium on electrochemistry in biology and medicine sponsored by the Electrochemical Society in 1953. Amplified versions of papers presented by 23 authorities are included. The subjects covered include membranes, nerve and plant cells, biologically important ions and applications of polarography, electrocardigraphy and electroencephalography in medicine. This stimulating book is highly recommended.

GREAT EXPERIMENTS IN BIOLOGY, edited by M. L. Gabriel and S. Fogel. Prentice-Hall, Englewood Cliffs, N. J. 1955. pp. 317. Illus. $3.95. The editors present selected scientific writings in the original in order to stimulate interest in the methodology and philosophical outlook on the part of the student. The papers have been selected to show the milestones in the advances of knowledge in the cell theory, general physiology, microbiology, plant physiology, embryology, genetics and evolution. Highly recommended.

A TREASURY OF AMERICAN GARDENING, edited by J. R. Whiting. Doubleday & Co., Garden City, N. Y. 1955. pp. 272. Illus. $7.50. This charming and handsomely illustrated volume will appeal to all who are interested in gardening. The ten chapters are devoted to garden writers, the home gardeners, the gardeners' story of the soil, a pictorial garden calendar, plant breeding, gardens of America, progress in plant science, kitchen garden, and the garden club story.

COLCHICINE in AGRICULTURE, MEDICINE, BIOLOGY AND CHEMISTRY, by O. J. Eigsti and P. Dustin. Iowa State College Press, Ames. 1955. pp. 470. illus. $6.50. This pioneer work brings under one roof the information on colchicine as a mitotic poison and as a tool for biological research. The topics covered include the source of colchicine, its chemistry and pharmacology, its effect on the nucleus, cell-division, and growth; experimental polyploids and aneuploids; and techniques of colchicine treatment in plants and animals. This stimulating text is indispensable to all who are interested in the subject.

THE LANGUAGE OF TAXONOMY, by J. R. Gregg. Columbia Univ. Press, New York 27, N. Y. 1955. pp. 70. illus. $2.50. Taxonomy, the science of classifying organisms according to their natural relationships has developed subtle and effective vocabularies for its descriptions of plants and animals. In the present book the author shows that mathematical logic offers linguistic techniques of comparable subtlety and effectiveness for the study of taxonomy itself.

VEGETABLE GROWING, by J. E. Knott. 5th ed. Lea & Febiger, Washington Sq., Phila. 6. 1955. pp. 358. illus. $5.00. In this 5th edition of a standard text on commercial vegetable growing, the author has brought the subject up-to-date. The text has been reorganized into three major sections—general considerations, cool season crops and warm season crops. The book is highly recommended to the student of commercial vegetable growing.

GROWING PLANTS UNDER ARTIFICIAL LIGHT, by Peggie Schulz. M. Barrows & Co., 425 4th Av., New York 16, N. Y. 1955. pp. 146. illus. $3.50. This concise and easily readable book on growing plants under artificial light is written by a layman for the layman. The text chapters are concerned with light and house plants, why plants need light, light set-ups, planters, home made set-ups, favorite plants and propagation under lights, growing seedlings indoors, lights in greenhouses, and dealers and supplies.

CLIMATIC ATLAS OF THE UNITED STATES, by S. S. Visher. Harvard Univ. Press, Cambridge, Mass. 1954. pp. 403. illus. $9.00. The objective of the author has been to assemble under one cover the available maps on the diverse climates of the United States. The 1031 maps and diagrams are presented in 34 chapters grouped into seven parts. Five parts embrace the major elements of climate, temperature, wind, sunshine, humidity and precipitation; and the other two, some consequences of climate and weather, and climatic regions and climatic changes. The consequences include those of agriculture, health, soil erosion, soil moisture, soil freezing, lakes, streams and topography. This outstanding contribution is indispensable to all students of the climates of the United States.

VASCULAR PLANTS OF ILLINOIS, by N. Jones and G. D. Fuller, et al. University of Illinois Press, Urbana. 1955. pp. 593. Illus. $10.00. This is a systematic, phytographical and bibliographical enumeration of the native and adventive vascular plants known to grow spontaneously in Illinois, belonging to 54 orders, 156 families, 785 genera, and about 2450 species. The distribution of 1375 species is shown by means of outline maps. This outstanding contribution will be welcomed by all who are interested in the flora of the United States.

A TEXTBOOK OF EVOLUTION, by E. O. Dodson. W. B. Saunders Co. 1953, pp. 419. Illus. The subject is presented for undergraduate students. The five parts of the book include (1) a summary of traditional knowledge on evolution; (2) phylogeny as concerned with the evolution of higher categories; (3) the origin of hereditary variations on which natural selection acts; (4) the origin of species; and (5) retrospect and prospect. This most stimulating, clearly written text fills a definite want and will be generally welcomed.

GENERAL CYTOLOGY, by E. D. P. De Robertis, W. W. Nowinski and F. A. Saez. 2nd ed. W. B. Saunders Co., Philadelphia. 1955. pp. 456.

Illus. This 2nd English edition of an important text was required by the rapid progress in this field of knowledge. The 12 chapters are devoted to the history of cytology; the chemical and physicochemical, the morphological and ctyochemical, and the submicroscopic organization of the cell; morphological and functional significance of cytoplasmic organoids; plasma membrane and cell permeability; structure and ctyochemistry of the nucleus in the interphasic state; chromosomes and cell division; cytogenetics; enzymes and cell metabolism; cytological and cytochemical manifestations of cellular activity; and differentiation, senescence and death of the cell. This stimulating text is indispensable to all interested in cytology.

BURRAGE ON VEGETABLES, by A. C. Burrage. D. Van Nostrand Co., 250 4th Av., New York 3, N. Y. 1954. pp. 208. Illus. $4.50. This charming book on vegetable culture is based on the author's experience. In part I, brief discussions are devoted to quality and rating of vegetables, cooking, storing, processing and freezing, the garden plan and location. Part II is devoted to the culture of vegetables; part III, to greenhouses, hotframes, mulching, tools, soil humus and pests; part IV, to seed lists, planting dates and fertilizers; and part V, to week-end vegetable gardens.

GENERAL MICROBIOLOGY, by W. G. Walter and R. H. McBee. D. Van Nostrand Co., 250 4th Av., New York 3, N. Y. 1955. pp. 345 Illus. $4.75. The objective of the book is to present the subject in such a manner as to encourage a beginning student to relate his daily living to the activities of the microbial world, and at the same time to acquire a scientific outlook on this phase of biology. This stimulating text is highly recommended.

MODERN ASPECTS OF pH WITH SPECIAL REFERENCE TO PLANTS AND SOILS, by James Small. D. Van Nostrand Co., 250 4th Av., New York 3, N. Y. 1954. pp. 247. Illus. $5.00. This stimulating text on the *new* pH is based upon an empirical standard because it is now recognized that what is being measured is not the concentration but the activity of hydrogen ions in relation to the activity of other associated ions. It is written by a botanist who emphasizes the applications of pH measurements to plant and soil research, and also to agriculture and industry. This concise and easily readable text is highly recommended.

EVOLUTION AS A PROCESS, edited by J. Huxley, A. C. Hardy and E. B. Ford. Allen & Unwin, London; and Macmillan Co., 60 5th Av., New York 11, N. Y. 1954. pp. 367. Illus. $4.25. The objective of the book, containing contributions by 19 prominent biologists, is to crystallize the outlook on the various aspects of the evolutionary process in plants and animals. This stimulating book is highly recommended for all students of evolution.

WEEDS, by W. C. Muenscher. 2nd ed. Macmillan Co., 60 5th Av., New York 11, N. Y. 1955. pp. 560. Illus. $10.00. This revised 2nd edition of the authoritative work on weeds will be welcomed by all. No less than 571 weeds are described with suggested control methods; 331 kinds are illustrated in the 135 plates. Part I is devoted to weeds and their control; weeds of special habitats; and detailed control methods. In Part II. weeds are arranged according to family, together with key. This book is indispensable to all who cultivate plants.

PLANT PROPAGATION PRACTICES, by J. S. Wells. Macmillan Co., 60 5th Av., New York 11, N. Y. 1955. pp. 344. Illus. $7.50. This clearly and concisely written and adequately illustrated text was prepared especially for the young nurseryman. The subject matter is grouped under five headings—setting up and equipping a propagation unit, basic propagation principles, propagating procedures, detailed procedures for propagating a select group of plants, and the propagator's year. This refreshing book is highly recommended.

BOTANY: PRINCIPLES AND PROBLEMS, by E. W. Sinnott and K. Wilson. 5th ed. 1955. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. pp. 528. Illus. $6.00. This clearly and concisely written revised 5th edition of a standard text on plant science will be welcomed by teachers and students alike. The plant is considered as a functioning structure and applications of botanical theory to agricultural problems are emphasized. The introductory chapters are followed by those devoted to plant anatomy, morphology, physiology, ecology, plant distribution, reproduction, heredity and variation, evolution, the plant kingdom, and botany and the future. This stimulating text is highly recommended.

METHODS OF PLANT BREEDING, by H. K. Hayes, F. R. Immer and D. C. Smith. 2nd ed. 1955. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. pp. 551. Illus. $8.50. This 2nd edition of an outstanding text and reference book on plant breeding has been revised in the light of new additions to methodology. The topics covered include the role of plant breeding; genetic and cytogenetic basis of plant breeding; heterosis; mode of reproduction in relation to breeding methods; technique of selfing and crossing; the pure-line method of improving naturally self-fertilized plants; back-cross method of plant breeding; breeding for disease and insect resistance; special techniques; breeding grains, flax, cotton, sorghum, maize, forage crops, and other cross-pollinated plants; and statistical methods in relation to plant breeding. This stimulating text and reference work is indispensable to all who are interested in plant breeding.

IRRIGATED SOILS, THEIR FERTILITY AND MANAGEMENT, by D. W. Thorne and H. B. Peterson. 2nd ed. 1954. Blakiston Co. & McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. pp. 302. Illus. The expansion of research showing that maximum yields from irrigation are dependent on the proper balance of such factors as fertility, plant population, plant characteristics, crop rotation, soil physical properties and soil moisture, was the premise on which the first edition was based, and this has justified the appearance of this second edition. The topics discussed include problems of irrigated regions; soil as a medium for plant growth; soil, water and plant relations; the salt problem; evaluating land for irrigation; source and quality of irrigation waters; measuring irrigation water; planning a farm for irrigation; irrigation practice; drainage; reclamation and management of saline and alkali soils; control of physical and biological properties of soils; maintaining organic matter in soil; mineral and plant growth; fertilizer elements and materials; using fertilizers; soil management for field, fruit, vegetable and specialty crops; and farm planning. This outstanding book is highly recommended.

CRYPTOGAMIC BOTANY, by Gilbert M. Smith. Vol. I. Algae and Fungi. 2nd ed. 1955. pp. 546. Illus. $8.50; Vol. II. Bryophytes and Pteridophytes. 2nd ed. 1955. pp. 399. Illus. $8.00. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y.

These revised 2nd editions of the outstanding standard texts on cryptogamic botany are designed for students who have had an introductory course in botany, and who wish to make a more intensive study of plants below the level of seed plants. Chapter I of Vol. I briefly outlines the classification of spore-producing plants, and the following 14 chapters carry the subject through the first 9 divisions comprising the algae and fungi. The 10 chapters of Vol. II are devoted to the five divisions that constitute the bryophytes and pteridophytes. These two concise, easily readable and adequately illustrated volumes are indispensable to the student of the cryptogams.

THE BIOLOGY OF MAN, by J. S. Hensill. Blakiston Co., & McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 1954. pp. 440. Illus. $5.50. This pioneering introductory college text has been written so as to present the major principles of animal biology as applied to man. The book is planned to impart to the student an understanding of (1) the relation of other organisms to, and the effects of other organisms on, the human organism; (2) the normal, and some of the abnormal, processes involved in the origin and development of human life; (3) the mechanism by which human characteristics are, or are not, inherited; and (4) the place, force, and significance of biological science in our modern society. This stimulating text is highly recommended.

CLASSICS OF BIOLOGY, edited by A. Pi Suñer. English translation by C. M. Stern. Philosophical Library, 15 E. 40th St., New York 16, N. Y. 1955. pp. 337. $7.50. The subject is presented in 26 chapters showing the high points of progress in biology by means of brief summaries and excerpts in the fields of physiology, reproduction, heredity, speciation, embryology, evolution, paleontology, causation and design, psychology, and correlation in the whole and its parts. This stimulating survey, written by an outstanding living biologist, will appeal to teachers and students, and also the general reader.

[PLANT LIFE LIBRARY, continued on page 162.]

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

I. THE AMERICAN AMARYLLIS SOCIETY

[Affiliated with the American Plant Life Society]

[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

(c) REGISTRATION OF PLANT NAMES

Registrars: Dr. J. B. S. Norton, Registrar, and Mr. W. D. Morton, Jr., Registrar of Amaryllis Names.

Correspondence about the registration of plant names should be sent directly to Dr. Norton, *4922 40th Place, Hyattsville, Maryland,* or Mr. Morton, 3114 State St., New Orleans, La. and a self-addressed, stamped envelope should be enclosed if a reply is expected.

(d) AMARYLLID SECTIONS

GENERAL AMARYLLID SECTION

General Amaryllid Committee—Mrs. Edith B. Strout, Chairman
Kentfield, California

Miss Elaine Brackenridge, *Texas*

AMARYLLIS SECTION

Amaryllis Committee—Dr. Robt. G. Thornburgh, *Chairman,*
517 Professional Bldg., Long Beach 2, Calif.

Col. Russell S. Wolfe, *South Carolina*
Mr. Thomas R. Manley, *Vermont*
Dr. Hamilton P. Traub, *California*
Mr. Wyndham Hayward, *Florida*
Mr. Armyn Spies, *Illinois*
Mr. J. F. Stewart, *California*

FLOWER TYPES AND SCORE CARD FOR HYBRID AMARYLLIS

For classification of flower types of Hybrid Amaryllis see PLANT LIFE (HERBERTIA) 10: 23-30. 1954. For SCORE CARD see PLANT LIFE (HERBERTIA) 1950, pp. 45-46 (for "Elegans" read "Belladonna").

NARCISSUS SECTION

Narcissus Committee—Mr. Grant E. Mitsch, *Chairman,*
Daffodil Haven, Canby, Oregon

Mr. Jan de Graff, *Oregon*
Mr. Fred M. Danks, *Australia*
Mr. Guy Wilson, *North Ireland*
Mr. Kenyon L. Reynolds, *California*
Dr. Edgar Anderson, *Missouri*
Mr. Arno H. Bowers, *Calif.*
Mr. Frank Reinelt, *California*
Mr. Lionel Richardson, *North Ireland*

ALSTROEMERID SECTION

Alstroemerid Committee—Mr. H. L. Stinson, *Chairman,*
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Mr. John F. Ruckman, *Pennsylvania*
Mr. Bruce Hinman, *Illinois*
Mr. W. M. James, *California*
Mr. Mulford B. Foster, *Florida*

ALLIEAE SECTION

ALLIEAE COMMITTEE—Mr. Bernard Harkness, *Chairman,*
Highland Park Herbarium, Rochester 20, N. Y.

Mr. F. Cleveland Morgan, *Quebec*
Mr. Claude A. Barr, *South Dakota*
Dr. Henry A. Jones, *Maryland*
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Mr. Elmer C. Purdy, *California*
W. R. Ballard, *Maryland*

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PANCRATIEAE COMMITTEE—Mr. Len Woelfle, *Chairman*
6106 Ridge Ave., Cincinnati 13, Ohio.
Mr. Wyndham Hayward, *Vice-Chairman, Winter Park, Fla.*

Dr. W. S. Flory, *Virginia*
Mr. Thad M. Howard, *Texas*
Mrs. John Schmidhauser, *Virginia*
Dr. Hamilton P. Traub, *California*

HEMEROCALLIS SECTION

DAYLILY (HEMEROCALLIS) COMMITTEE—Mr. Elmer A. Claar, *Chairman,*
617 Thornwood Lane, Northfield, Ill.

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Mr. W. Quinn Buck, *California*
Prof. W. R. Ballard, *Maryland*
Mr. Wyndham Hayward, *Florida*
Dr. Philip G. Corliss, *Arizona*
Dr. J. B. S. Norton, *Maryland*

[Members of the Hemerocallis Jury are *ex officio* members of the Daylily Committee].

DAYLILY JURY (For evaluating Daylilies)—Dr. Robert E. Lee, *Chairman,*
Cornell University, Ithaca, N. Y.

Those in charge of Official Cooperating Trial Gardens are *ex officio* members of the Daylily Jury.

OFFICIAL COOPERATIVE DAYLILY TRIAL GARDENS

Prof. John V. Watkins, in charge of Daylily Trial Garden, College of Agriculture, University of Florida, Gainesville, Fla.

Mr. Paul L. Sandahl, Supt., in charge of Daylily Trial Garden, Dept. of Parks and Public Property, City of Des Moines, Iowa.

Prof. Ira S. Nelson, in charge of Daylily Trial Garden, Dept. of Horticulture, Southwestern Louisiana Institute, Lafayette, La.

Dr. Robert E. Lee, in charge of Daylily Trial Garden, Dept. of Agriculture, Cornell University, Ithaca, N. Y.

Prof. H. T. Blackhurst, in charge of Daylily Trial Garden, Division of Horticulture, Texas Agric. Expt. Station, College Station, Texas.

Mr. John E. Voight, RFD One, Box 76, Hales Corners, Wisc., in charge of Daylily Trial Garden, at The Botanical Gardens, Whitnall Park.

Mr. W. Quinn Buck, in charge of Daylily Trial Garden, Los Angeles Arboretum, 291 No. Old Ranch Road, Arcadia, Calif.

Note: Introducers of new daylily clones should send plants directly to the Trial gardens for testing. As soon as practical each trial garden will publish, in HERBERTIA, lists of the 10, 25, 50 and 100 best daylilies, on the basis of the clones tested, for the climatic region in which it is located.

II. OTHER COMMITTEES

GESNERIACEAE COMMITTEE—Dr. Kenneth H. Mosher, *Chairman,*
7215 Dayton Ave., Seattle 3, Washington

Mr. E. Frederick Smith, *California*
Mr. Wyndham Hayward, *Florida*

ARACEAE COMMITTEE—Mr. Wyndham Hayward, *Chairman,*
Winter Park, Florida

Mr. Len Mirzwick, *California*
Dr. Hamilton P. Traub, *Maryland*
Mr. Leon W. Frost, *Florida*
Dr. Robt. G. Thornburgh, *California*
Mr. Fred Danks, *Australia*
Mr. Len Woelfle, *Ohio*
Mr. Alex D. Hawkes, *California*

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III. PUBLICATIONS OF THE AMERICAN PLANT LIFE SOCIETY

BOOKS

1. AMARYLLIDACEAE: TRIBE AMARYLLEAE, by Traub & Moldenke (including the genera Amaryllis, Lycoris, Worsleya, Lepidopharynx, Placea, Griffinia, and Ungernia; Manila covers; 194 pages, incl. 18 illustrations. $5.00 postpaid. This is required reading for every amaryllid enthusiast.

2. DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948, by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $2.50 postpaid.

PERIODICALS

(A) **HERBERTIA [First series,** 1934 to 1948, incl.], devoted exclusively to the amaryllids (Amaryllidaceae), and the workers concerned in their advancement. A complete set of these volumes is indispensable to all who are interested in the amaryllids. Libraries should note that this may be the last opportunity for complete sets.

Volume 1 (1934). Dedicated to **Henry Nehrling.** Containing the biography of Henry Nehrling, and many valuable articles on amaryllis; with a portrait of Henry Nehrling and 16 other illustrations; a total of 101 pages.

Volume 2 (1935). Dedicated to **Theodore L. Mead.** Containing the autobiography of Theodore L. Mead, and many excellent articles on varieties, breeding, propagation, and culture of amaryllids; with portraits of Theodore L. Mead and David Griffith and 18 other illustrations; a total of 151 pages.

Volume 3 (1936). Dedicated to **Arthington Worsley.** Containing the autobiography of Arlington Worsley, and important articles on description, genetics and breeding, physiology of reproduction, and amaryllid culture; with 3 portraits of Arlington Worsley, one color plate, and 30 other illustrations; a total of 151 pages.

Volume 4 (1937). First British Edition. Dedicated to William Herbert. Containing the biography of William Herbert; the reprint of Herbert's essay, "On Crosses and Hybrid Intermixtures in Vegetables"; Dr. Darlington's essay, "The Earlv Hybridizers and the Origins of Genetics," and many important articles on description; cytology, genetics and breeding; physiology of reproduction, and amaryllid culture; with two portraits, forty-four other plates and three figures; a total of 280 pages.

Volume 5 (1938). First Netherlands Edition. Dedicated to Ernst H. Krelage. Containing the autogiography of Ernst H. Krelage; the history of amaryllid culture in Holland by Ernst H. Krelage, Dr. Uphof's important article in which the name Hippeastrum is rejected; a revision of the tribes of the Amaryllidaceae; and the species of Amaryllis; outstanding articles on forcing amaryllis by Dr. Grainger and Prof. Dr. van Slogteren; and many other articles on description, cytology, genetics and breeding; physiology of reproduction, and amaryllid culture; with 33 plates and 2 figures; a total of 218 pages.

Volume 6 (1939). Dedicated to the Union of **South Africa,** and containing articles on South African amaryllids, including the history of botanical exploration for amaryllids in South Africa, the distribution of South African amaryllids in relation to rainfall, and a review of the genus Agapanthus by Frances M. Leighton, a review of the Genus Cyrtanthus, with many excellent line drawings, by Dr. R. A. Dyer; other articles—Zephyranthes of the West Indies by Dr. Hume; the Tribe Gilliesieae by Dr. Hutchinson; rating of daylilies for garden value by Mr. Kelso; daffodil articles by Jan de Graaff, and many other items on description, cytology, breeding, propagation, and amaryllid culture; with 44 plates and 10 figures; a total of 258 pages.

Volume 7 (1940). Dedicated to **Latin America,** and featuring articles on Latin American amaryllids; biographies of Drs. Philippi and Holmberg; report by Dr. Goodspeed on the amaryllids collected by the Univ. of Calif., Second Andean Expedition; reports on the flowering of the "Blue Amaryllis," A. procera; and many other important articles on the description, propagation, breeding, culture, harvesting and storage of amaryllids. Of special interest are the important articles on the description, breeding and culture of daylilies by noted authorities. With 45 illustrations—30 plates and 15 figures—and a total of 242 pages.

Volume 8 (1941). First Daylily Edition. The first extensive symposium on the daylily, containing biographies of George Yeld, Amos Perry, Hans Sass, and Paul Cook, and important articles on daylily evaluation, breeding, propagation and culture. Also important articles on Narcissus and other amaryllids. Thirty-eight illustrations—27 plates and 11 figures—and a total of 185 pages.

Volume 9 (1942). First Alstroemerid Edition. Dedication to Harry L. Stinson, the outstanding authority on this plant group, who contributes a summary of his work on Alstroemerid taxonomy, breeding, propagation and culture. This volume contains the autobiography of Prof. Dr. Abilio Fernandes, the Check-List of Amaryllids by Major Pam, and a review of the species of Crinum by Dr. Uphof, and also many important articles on daylilies, Narcissus, Cyrtanthus, hybrid Amaryllis, Ixiolirion and other amaryllids. Thirty-five illustrations—17 plates and 18 figures—and a total of 243 pages.

Volume 10 (1943). 10th Anniversary Edition. Dedicated to Elizabeth Lawrence, the outstanding authority on the use of amaryllids in the garden, who contributes a summary of her work in this field. This volume contains the review of Agapanthus and Tulbaghia, by Dr. Uphof; and article on Brunsvigia rosea and hybrids by Mr. Hannibal; a symposium on Narcissus breeding by Messrs. Powell, Reinelt, Berry and Reynolds; a review of amaryllid chromosomes by Dr. Flory; articles on hybrid amaryllis, daylilies, and many other important articles on amaryllids. Forty-one illustrations—12 plates and 29 text figures—and a total of 205 pages.

Volume 11 (1944). First Allieae Edition. Dedicated to Dr. Henry A. Jones, the eminent American authority on the onion. This is one of the most outstanding issues up to the present for its record making contributions on the systematics of Allium by British authorities, and on onion breeding, propagation, and culture by American authorities. It contains Mr. Airy Shaw's translation of Vvedensky's Allinus of the Soviet Union; Stern's essay on the onion in the Old World and other articles; and articles on onion breeding, propagation and culture by Dr. Jones and his colleagues. There are also important contributions on ornamental Alliums for North America, and Allieae of North America. There are excellent articles on hybrid Amaryllis, Daylilies and various other amaryllids. Forty-three illustrations—25 plates and 18 text figures—and a total of 369 pages.

Volume 12 (1945). First Educational Edition. Dedicated to Supt. R. C. Huey, a pioneer in the use of amaryllids as an educational tool. This volume contains a brief autobiography by Supt. Huey, and an article by him on the use of amaryllids in teaching plant science; the announcement by Mulford B. Foster of the reintroduction of the sweet-scented Alstroemeria caryophyllaea, and an article by Harry L. Stinson on the true Alstroemeria Ligtu. This issue also contains an article on the origin of Tapeinanthus humilis by A. & R. Fernandes; important articles on Narcissus breeding; Leucocoryne and related genera; articles on various other amaryllids, including valuable contributions on Hemerocallis description and appreciation, breeding, culture, and packing daylily plants for shipping. Twenty-four illustrations—15 plates and 10 text figures—a total of 180 pages.

Volume 13 (1946). First Narcissus Edition. Dedicated to Guy L. Wilson, the noted Narcissus breeder. This volume contains an autobiography of Mr. Wilson, an article on his breeding activities; an article on Narcissus breeding in Australia by Mr. Alston; articles by American Narcissus breeders, including Frank Reinelt, E. P. Powell, J. S. Cooley, C. W. Culpepper and W. R. Ballard; an article on the karyology of the subgenus Ajax of the genus Narcissus by A. and R. Fernandes; a list of parents of hybrid Narcissus by Arno H. Bowers; Narcissus diseases by C. J. Gould; Narcissus insects and mites by E. P. Breakey; Narcissus culture by various authors. There are also articles on other amaryllids—Hemerocallis, hybrid Amaryllis, Habranthus, Crinums, Lapagerias, Agapanthus, Hymenocallis, etc. Thirty-nine illustrations—186 pages.

Volume 14 (1947). 2nd Hemerocallis Edition. Dedicated to Ralph W. Wheeler, the noted Daylily breeder. This volume contains an autobiography of Mr. Wheeler and an article on his breeding activities; and many important articles on Hemerocallis description, evaluation, breeding, etc., from various parts of the country. There are also important articles on other amaryllis—Hybrid Amaryllis, amaryllids in the Holy Land and Mexico, starch in Alstroemeria, the Galantheae, Double Narcissus, Zephyranthes, Sternbergia, Allium, etc. Twenty-eight illustrations—206 pages.

Volume 15 (1948). 2nd South African Edition. Dedicated to Dr. R. A. Dyer. This volume contains an autobiography of Dr. Dyer and two amaryllid articles by him, and other articles on South African amaryllids. There are also important articles on Hemerocallis, Amaryllis, Crinum, Narcissus, Brodiaea Lilies, Alstroemerias and other amaryllids by various authors. Forty-one illustrations—177 pages.

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(B) PLANT LIFE, including numbers on various plant subjects, 1945 to date; and the **Second Series** of **HERBERTIA,** 1949 to date. It should be noted that the numbers of **HERBERTIA** of the **second series,** beginning in 1949, are in every way equivalent to those of the first series, and are devoted exclusively to the amaryllids.

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Vol. 1 (Nos. 1—3). 1945. Symposium on **Narcissus** breeding by various authors. **First Bromeliaceae Edition.** Profusely illustrated symposium on the bromels by Dr. Lyman B. Smith, Mulford B. and Racine Foster, David Barry, Jr., Ladislaus Cutak, and Wyndham Hayward. **25 illustrations—105 pages.**

Vol. 2 (Nos. 1—3). 1946. **Verbenaceae Edition.** Illustrated treatise on the Verbena Family by Dr. and Mrs. Moldenke, the outstanding authorities on this plant family. 9 illustrations—100 pages.

Vol. 3 (Nos. 1—3). 1947. **General Edition.** Containing an illustrated article on winter and spring flowering Gladiolus by W. M. James, and articles on the Dutch Bulb Industry by Dr. A. J. Verhage and J. F. Ch. Dix. 10 illustrations—42 pages

Vol. 4 (Nos. 1—3). 1948. **Aroid Lily Edition.** An illustrated treatise primarily on the genus Zantedeschia (Aroid Lily) containing articles by Hamilton P. Traub, A. A. Longmire, Fred M. Danks, H. M. Butterfield, Wyndham Hayward and Len Mirzwick. 11 illustrations—48 pages.

Vol. 5 (Nos. 1—4) 1949. 34 illustrations, a total of 134 pages.

Gesneriaceae Edition, with important articles on the subject by F. E. Smith, W. Hayward and the Moshers.

1949 HERBERTIA Edition, devoted exclusively to the amaryllids; the **First Australian Edition,** dedicated to Capt. C. O. Fairbairn, with biographies of Australian amaryllid pioneers, and articles on Australian amaryllids, South African amaryllids, the Pink Amaryllis, **A. belladonna** var. **Haywardii,** with illustration, hybrid Amaryllis breeding in South Australia by E. Both, Narcissus culture by Dr. Cooley, Mr. Mitsch and Mr. Ballard, and also important articles on other amaryllids.

Vol. 6 (Nos. 1—4) 1950. 47 illustrations, a total of 162 pages.

1950 HERBERTIA Edition, devoted exclusively to the amaryllids; the Hybrid Amaryllis Edition; dedicated to Mrs. Mary G. Henry, containing Mrs. Henry's autobiography; articles on Collection Amaryllids in South America by M. B. Foster; Amaryllis flower types; double Amaryllis; Amaryllis of To-morrow, by W. Hayward, and other articles on hybrid Amaryllis, Hemerocallis, Cyrtanthus, Blue Amaryllis, South African Amaryllids, Review of the genus Brunsvigia (part I) by R. A. Dyer, etc.

Caladium Edition, with articles on Caladium by W. Hayward, on Winter Jasmine by Prof. Norton, on Bartram's Ixia by W. Hayward, and Plant Life Library (book reviews), the American Plant Life Society, and Seeds and Plants Directory.

Vol. 7 (Nos. 1—4) 1951. 51 illustrations, a total of 174 pages.

1951 HERBERTIA Edition, devoted exclusively to the amaryllids; the **Latin American Amaryllid Exploration Edition,** dedicated to M. B. Foster; containing Mr. Foster's autobiography, and articles on Collecting Amaryllids in Latin America by M. B. Foster, new South American Amaryllis species and other amaryllid species, Amaryllis Exhibition at Cleveland, New Orleans Amaryllis Show, Review of the genus Brunsvigia (part II) by R. A. Dyer, Hybrid Amaryllis trials at Valleevue, by Thos. R. Manley, new pink hybrid Amaryllis, Narcissus culture by Mr. Mitsch, and Dr. Cooley; Hemerocallis culture by Mr. Lenington, Hemerocallis polyploids, and other amaryllid articles.

Gloriosa Lily Edition, with articles on the Gloriosa Lily by W. Hayward, plant growing experiences by W. Allgeyer, Western Trip by Mrs. Henry, Plant Life Library (book reviews), the American Plant Life Society, and Seeds and Plants Directory.

Vol. 8 (Nos. 1—4) 1952, with 34 illustrations, a total of 183 pages.

1952 HERBERTIA Edition, devoted exclusively to the amaryllids: the **Second Alstroemeria Edition**, dedicated to Dr. Uphof, containing an autobiography of Dr. Uphof, a review of the genus Alstroemeria by Dr. Uphof, the Amaryllis Displays at Cleveland, and New Orleans, the Orlando-Winter Park Hemerocallis show, Amaryllis evaluation by Thos. R. Manley, Dr. Thornburgh, C. E. Buck, E. Douglas, and Hermon Brown; articles on Fragrant Alstroemeria hybrids by M. B. Foster, advances in Alstroemeria culture by Harry L. Stinson, Alstroemeria articles by Prof. Bullock, Prof. Ballard, Mr. Ruckman, and E. O. Orpet. The issue also contains descriptions of a new Amaryllis species, and a new Zephyranthes species, and articles on Zephyranthes by Mrs. Clint, on Lapiedra martinezii by Dr. Fernandes, Alliums by B. Harkness, amaryllid garden material by W. L. Hunt and Thad Howard, Narcissus culture by Mr. Mitsch, Crinum zeylanicum by Mr. Hayward, Hemerocallis by Mr. Gilmer, and Mrs. Henry, Hymenocallis by Mr. Woelfle, Amaryllid color by Mr. Hannibal, and other important articles.

Malvaceae Edition, with articles on the Perfect Mallow Marvel by E. Sam Hemming, a new Hybrid Hibiscus, by Prof. Ballard, and propagation of Hibiscus, by Dr. Hava; and a report on plant culture activity in the Southwest Region by Dr. Corliss, the Plant Life Library (book reviews), the American Plant Life Society and Seeds and Plants Directory.

Vol. 9. (Nos. 1—4) 1953, with 32 illustrations, a total of 166 pages.

1953 HERBERTIA Edition, devoted exclusively to the amaryllids; sponsored by the **American Amaryllis Society,** which is affiliated with the **American Plant Life Society.** This is the **Second Narcissus Edition,** dedicated to E. A. Bowles, containing a portrait of Mr. Bowles, and papers on Narcissus: a review of 40 years devoted to Narcissus breeding by Guy L. Wilson, an article on miniatures, naturalizing, decoratives, and a beginners' list by C. E. Quinn, fall-flowering Narcissus by L. S. Hannibal, Narcissus breeding by E. C. Powell, and W. R. Ballard, Daffodils in Piedmont, Virginia by H. I. Tuggle, old naturalized Narcissus in the South by Mrs. Evans, Daffodils in 1952 by Grant E. Mitsch, and Daffodils in northern California by H. I. Johnson.

There are also articles on other amaryllids, including reviews of Amaryllis Shows in New Orleans and Houston, papers on the evaluation of Hybrid Amaryllis by Mr. Manley and Dr. Thornburgh, an article on Allium by R. B. Freeman, Amaryllis species by Mrs. Mary G. Henry, the Orpets, and Mr. Burlingham, Hemerocallis by S. E. Saxton, George Gilmer, and W. R. Ballard, Calostemma by Mr. Chandler, Crinum scabrum by Thad M. Howard, Lycoris by Wyndham Hayward, Hymenocallis by Len Woelfle, and on other amaryllid subjects, including the description of two new Amaryllis species.

Agavaceae Edition, with articles on Dracaena and Cordyline by Mrs. Morris Clint, The Tribes and Genera of the Agavaceae, and Polianthes tuberosa by Hamilton P. Traub, Beaucarnea recurvata by Mulford B. Foster, and sections on The Plant Life Library (book reviews), the American Plant Life Society, a complete list of publications, and Seeds and Plants Directory.

Vol. 10. (Nos. 1—4) 1954, with 23 illustrations, a total of 143 pages.

1954 HERBERTIA EDITION, devoted exclusively to the Amaryllids; sponsored by the American Amaryllis Society, which is affiliated with the American Plant Life Society. This is the **Second Amaryllis Edition,** dedicated to Thomas R. Manley, M. S., and contains an autobiography of Mr. Manley and three valuable articles by Mr. Manley on the evaluation, forcing culture and merchandising of Amaryllis; articles on the Divisions of cultivated Amaryllis by H. P. Traub, evaluation of Amaryllis by Dr. Thornburgh, the McCulloch hybrid Amaryllis by Edith B. Strout and Polly Anderson, Amaryllis and other amaryllid culture by Armyn Spies, Mrs. W. D. Morton, Wyndham Hayward, Mrs. Jo. N. Evans, and Dr. Philip G. Corliss; Amaryllis insects and mites by Dr. Floyd F. Smith and C. L. Burlingham; Amaryllis propagation by

John T. Weisner; Amaryllis flower arrangements by Dr. Philip G. Corliss; Hemerocallis by Prof. W. R. Ballard, S. E. Saxton, and W. Quinn Buck; Narcissus by Dr. Cooley and Prof. Ballard; Alliums and Zephyranthes by Thad M. Howard, the New Orleans and Mobile Amaryllis shows for 1953, and other interesting articles.

The **General Edition,** contains articles on the Giant Aborescent Philodendrons and the Delightful Ginger Lilies by Wyndham Hayward, the genus Nothoscordum by H. P. Traub, a note on the new Code for naming Cultivated plants, the Plant Life Library (book reviews), the American Plant Life Society, a complete list of publications, and seeds and Plants Directory.

Vol. 11. (Nos. 1—4) 1955, with 33 illustrations, a total of 146 pages.

1955 HERBERTIA EDITION, devoted exclusively to the Amaryllids; sponsored by the American Amaryllis Society, which is affiliated with the American Plant Life Society. This **General Amaryllid Edition** is dedicated to Dr. Robert F. Hoover, the 1955 Herbert Medalist, contains the autobiography of Dr. Hoover, and an article that brings the nomenclature of the Brodiaea Lilies up to date. Articles on **Amaryllis** include—evalution of hybrid **Amaryllis,** by Dr. Thornburgh, reminiscences by W. E. Rice, more experiences with Dutch **Amaryllis** by Mr. Weisner, 27 years with **Amaryllis** in northern Illinois by Mrs. Tebban, growing **Amaryllis** in California, by Mr. Stewart; and a report on collecting **Amaryllis** in South America in 1954, by Prof. Ira S. Nelson.

Other articles include—the rediscovery of **Zephyranthes concolor** by Mrs. Clint; flowering habit of **Ammocharis** by Mr. Hannibal; cytology of **Tulbaghia violacea** by Drs. Whitaker and Flory; inheritance of seed color characters in **Brunsvigia** by Mr. Hannibal; hybridization in **Hymenocallis** by Mr. Woelfle; Haemanthus, by Mr. Spies; **Lycoris** by Mr. Sayler; Nerines by Mr. Hayward; Amaryllis in the Cleveland Public School program, by Mr. Cooke, Jr.; and other interesting articles.

The General Edition, contains articles on vacation trips by W. M. James; the Saratoga Hortcultural Foundation, by Mr. James; rack for exhibiting flowers by Dr. Corliss; the genus **Ipheion,** by Drs. Traub & Moldenke; Rose Breeding, Dwarf Thyme; dwarfing fruit trees; and an Outline for the Gardening Program in the Cleveland Public Schools, by Paul R. Young; the Plant Life Library (book reviews); the American Plant Life Society; and a complete list of publications.

Vol. 12. (Nos. 1—4) **1956,** with 39 illustrations, a total of 162 pages.

1956 HERBERTIA EDITION, devoted exclusively to the amaryllids; sponsored by the American Amaryllis Society, which is affiliated with the American Plant Life Society. This **General Amaryllid Edition** is dedicated to **E. O. Orpet,** the 1946 Herbert Medalist. A **biography** of Mr. Orpet detailing the contributions made by him toward the advancement of the **amaryllids,** is presented by Mrs. Mildred Orpet.

Articles on **Amaryllis** include—pure white and double **Amaryllis,** propagation and rooting problems; **Amaryllis** breeding and culture and evaluation.

There are articles **amaryllid exploration, Zephyranthes flammea, Haemanthus zambesiacus, Eurycles sylvestris, Pancratium zeylanicum,** the **Pancratieae, Pseudostenomesson vargasii, Bloomeria humilis, Narcissus** and daylily breeding, key to the genus **Rhodophiala,** description of **Hymenocallis** species, amaryllid breeding and culture, and various other items.

The 1946 **GENERAL EDITION,** contains articles on **Belgian** and **English** flower shows, the **Sequoias,** the arborescent **Philodendrons, Heliconias** and **Curumas** in Florida, **Banana** culture, Plant Life **Library** (book reviews), and other items.

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[DAYLILY PERFORMANCE—DR. CORLISS, continued from page 114.]

nine or ten in the evening may close at six in hot weather or climate. The performance of some daylilies in response to temperature, however, is erratic—'Night Life' (Register) is said to open in mid-afternoon in the (cold) north, while in my (hot) garden it opens at sundown! I am fond of 'Amur Valley' (Marshall) not only because of its high branching and early and almost continuous bloom but because it opens before noon (not until noon in coldest weather, but about 9 A. M. in hottest) and remains open well into the night, whatever the temperature.

WHAT TO DO ABOUT IT? Performance must be checked under all kinds of environments for correct evaluation. Some clones may be difficult in PARTS of the same garden in some regions. There is a common superstitition about ''sticking a cutting'' under the ''mother'' plant to ensure its rooting. Like most superstitions, there is some factual basis for this: The conditions under which the ''mother'' plant thrived have proved suitable for the clone. When I divide and move a daylily, I have learned to replant a portion at the original site to be sure of its survival: 'Blanche Hooker' (Stout) which is so important in breeding for early and continuous bloom is unhappy in many parts of my garden. Some clones which have succumbed in certain parts of my garden have been replaced and replanted in another bed; some of these, the most notable example being 'Galahad' (Lester), have thrived at the new site, while other clones will apparently not grow in any part of my garden.

While failure in some cases is due to poor cultural practice, there are surely many clones which perform differently under varying conditions. I would like to see each popular named clone rated by growers in each region, with their cultural preferences listed. As with all ''Popularity Polls'' where gardeners in various regions participate, there may be clones half way down the list which are supreme in the gardens of one region and dismal failures in other regions.

[PLANT LIFE LIBRARY, continued from page 152.]

INDOOR PLANTS AND HOW TO GROW THEM, by A. Bertrand. Philosophical Library, 15 E. 40th St., New York 16, N. Y. 1955. pp. 92. Illus. $4.75. The objective of this concise little book, translated from the French by Vera Higgins, is to instruct the amateur in the care of plants in the home. After the brief sections on how plants live, the soil, the pots, watering, soil-less culture, and causes of failure, the rest of the book is devoted to the culture of a number of selected plants. The book is well illustrated, including color plates.

CLIMATES IN MINIATURE, by T. Bedford Franklin. Philosophical Library, 15 E. 40th St., New York 16, N. Y. 1955. pp. 137. Illus. $3.75. This charmingly written report on climates of relatively small areas based mainly on experiments carried out by the author with inexpensive apparatus shows how some animals keep warm in winter, the role of different soils and their temperatures, the way to forecast frost and achieve protection against frost damage, the effects of humidity, windbreaks and light and shade on plants, and why the effects of spring are first felt in hedgerow and wood. This utterly fascinating book is recommended for all readers.

CROP PROTECTION, by G. J. Rose. Philosophical Library, 15 E. 40th St., New York 16, N. Y. 1955. pp. 223. Illus. $10.00. This easily readable text was written by a British authority for the cultivator—whether large or small—faced with the problem of protecting his crops. The book is divided into four sections: (1) general considerations; cultural control; formulations; dusts, etc.; (2) chemicals; weed killers; insecticides; fungicides; rodenticides; (3) description of applicating machinery; and (4) the protection of stored products. The illustrations are excellent.

PLANTS WITHOUT FLOWERS, by H. Bastin. Philosophical Library, 15 E. 40th St., New York 16, N. Y. 1955. pp. 146. Illus. $6.00. From a brief speculative survey of the earliest forms of life upon the earth, the author proceeds to trace the evolutionary ascent of flowerless plants through the slime-fungi and bacteria, algae, lichens, true fungi. mosses and liverworts, ferns, horsetails and club-mosses. This delightful book is recommended for all readers.

THE HOME GARDENING ENCYCLOPAEDIA, new ed. 1955. Philosophical Library, 15 E. 40th St., New York 16, N. Y. pp. 368. Illus. $6.00. This concise reference work by a British editor and intended for British home gardeners consists of brief informative statements about the plants, gardening operations, etc., arranged alphabetically. The American home gardener may profit by using such a British work in connection with the garden reference books which he already possesses.

[PLANT LIFE LIBRARY, continued on page 4.]

PLANT LIFE, VOL. 13, NO. 1, JANUARY, 1957

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Box 150, La Jolla, California

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EDITED BY
Hamilton P. Traub
Harold N. Moldenke

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California

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PLANT LIFE, VOL. 13, NO. 1, JANUARY, 1957

HERBERTIA

1957

Year Book of
The American Amaryllis Society
23rd issue

FIRST LYCORIS EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 151.]

PREFACE

This 23rd issue of HERBERTIA is dedicated to Mrs. Morris Clint who received the 1957 HERBERT MEDAL AWARD for her outstanding contributions to amaryllid culture by introducing various species of *Zephyranthes, Habranthus, Sprekelia* and *Hymenocallis* from Mexico; and for her contributions toward popularizing the amaryllids in the United States. Mrs. Clint contributes a charming autobiography, and also a stimulating report on her amaryllid explorations in Mexico and Texas. The beautiful cover design is based on *Zephyranthes clintiae,* named in her honor, and it is the work of her gifted daughter Marsha Clint Wilson (Mrs. David E. Wilson).

This is also the first LYCORIS EDITION of HERBERTIA. The lycoris have been a neglected gardening opportunity which was understandable so long as only a few kinds were available. However, this is no longer true. Of the fifteen species recognized, twelve are at present available by a little searching in the United States. The color range is most interesting, including whitish, cream, straw, sulfur yellow, cadmium orange, red, blood-red, lavender, pink and bluish. Those who have them in their gardens eagerly look forward each season to lycoris time from late July to late fall. Most species can be grown in the southeast, south Texas, southern Arizona and California. *Lycoris squamigera, L. sanguinea, L. radiata* and *L. traubii* can be grown farther north but the exact range has not been established. It is hoped that those who grow them in the north will report in HERBERTIA for the benefit of the members. Those who do not have any lycoris should make good the deficiency without delay. A few members have started breeding experiments. Those who have been most active in popularizing lycoris are Sam Caldwell of Nashville, Tenn., Mr. Wyndham Hayward of Winter Park, Fla., Mr. Cecil Houdyshel of La Verne, Calif., and Mr. O. R. Johnson of Bound Brook, N. J.

In the present issue an attempt is made to include stimulating articles on lycoris which include contributions by Sam Caldwell, O. R. Johnson, Mrs. Klottz, Mr. Wood, Mr. Hayward and Dr. Bose. It is important to note that four *new* species of *Lycoris* are described in this issue, and one hybrid—a landmark. These articles serve as an introduction; more are to follow in future issues.

As in previous issues, the other amaryllids are not neglected. There are articles by Dr. Thornburgh, Mr. Klotzbach, Mrs. Pickard, Mrs. Elias, Mrs. Harding, Mr. Carsley, Mr. Weisner, Mr. Sayler and Dr. Joseph Smith. There is a report on the rediscovery of the Leopard Amaryllis by Prof. Nelson; *Amaryllis forgetii* by Mr. Harradine, and Round Robin Notes by Mrs. Flick.

Mrs. Seale writes about *Sprekelia*, Mr. Gilmer on *Hemerocallis*, Mr. Hannibal on *Brunsvigia rosea* (Cape Belladonna) hybrids, *Ammacharis,* and *Crinum.* Mr. Jones reports on crossing Texas Zephyranthes. Beautiful new species of *Habranthus* and *Chlidanthus,* and the new genus *Rauhia,* are described. There are reports on Amaryllis shows in New Orleans and Mobile, a report on visits with amaryllid enthusiasts by Dr.

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Howard, and other worth while contributions.

The 1958 HERBERTIA, the 24th issue of the yearbook of the AMERICAN AMARYLLIS SOCIETY, will be dedicated to Mr. Wyndham Hayward of Winter Park, Florida, who was largely responsible for the revival of interest in the amaryllis since 1933 when the AMERICAN AMARYLLIS SOCIETY was organized.

Contributors to the 1958 issue are requested to send in their articles by September 1, 1957 in order to insure publication of this issue in early January if possible. Time of publication depends entirely on the receipt of the articles, and the cooperation of all towards early publication will be greatly appreciated.

April 15, 1957,
5804 Camino de la Costa,
La Jolla, California.

Hamilton P. Traub
Harold N. Moldenke

CORRIGENDA

PLANT LIFE, VOL. 12, 1956

Page 3, 2nd line of text; Page 5, Dedication; Page 6, Plate 1, legend; Page 7, title of article, and 2nd line of text, for "Edwin Owen Orpet" read "Edward Owen Orpet".

Page 21, Fig. 3, first line, for "Mrs. E. B. Seale" read "Mrs. B. E. Seale".

Page 75, in title "SPECIES NAMES AND SYNONOMY" change the last word to "SYNONYMY".

TABLE OF CONTENTS at end of volume, page [iii], entry for Page 7, and on page [v], entry for page 6, for "Edwin Owen Orpet" read "Edward Owen Orpet".

[PLANT LIFE LIBRARY—continued from page 130.]

GENETICS; THE MODERN SCIENCE OF HEREDITY, by E. O. Dobson. W. B. Saunders Co., West Washington Sq., Phila. 5, Penna. 1956. Pp. 329. Illus. The purpose of this excellent book is to present a genetics course for "those many students who may later apply their genetic knowledge in medicine, in plant or animal breeding, in one or another of the specialized fields of botany or zoology, or even as professional geneticists". The subject matter is grouped into four sections—principles of genetics, the more advanced aspects of genetics or special applications, human genetics, and historical retrospect. This is among the finest genetics texts and is highly recommended.

MICROBIOLOGY; GENERAL AND APPLIED. 2nd ed. by W. B. Sarles, W. C. Frazier, J. B. Wilson & S. G. Knight. Harper & Brothers, 49 E. 33rd St., New York 16, N. Y. 1956. Pp. 491. Illus. $5.75. This thorough revision of a standard comprehensive text is designed for students in general science, agriculture, home economics, pharmacy, chemistry and engineering. It introduces beginning students to the microorganisms: algae, bacteria, viruses, higher bacteria and protozoa. This clearly written and stimulating text is highly recommended.

Dedicated to

Katherine Lamberton Clint

Herbert Medalist—Katherine Lamberton Clint

Plate 1

KATHERINE LAMBERTON CLINT

An autobiography

It is with pride and a deep sense of humility that I acknowledge the honor of the highest award of the American Amarylis Society with the usual autobiography. To the many who have contributed, either by inspiration, counsel or actual help, toward my endeavors, I wish to express my sincere appreciation and grateful thanks. Among these kind friends are Wyndham Hayward, Dr. Thad M. Howard, Dr. Walter S. Flory, Jr., Len Woelfle and Miss Willie May Kell. I am deeply indebted to Fred B. Jones for his help, both in research and in the field. I am especially indebted to Dr. Hamilton P. Traub for his technical advice, his unflagging interest in my work and his patience in evaluating my amateur observations. To my husband Morris I owe an equal share in this great honor, for his quick eye, his untiring job of chauffering, his unlimited optimism and enthusiasm which have made the difference between success and failure.

I was the eldest of three children, two girls and a boy, and was born on June 12, 1904 in Kentwood, Louisiana, where my father was manager of the local bank. My parents were Lois Adah Gill of Magnolia, Mississippi and Placide Marc Lamberton of New Orleans, Louisiana. My ancestors date back to pre-revolutionary days on both sides of the family—of Dutch, Irish and English extraction on my mother's side, while my father was half French and half Scotch.

When I was about a year old, my father accepted a position with the Carrollton branch of one of the larger banks in New Orleans. There, we lived for a short time with my Grandfather Lamberton and even after we moved into our own home in the comparatively new section of Carrollton, I paid long and frequent visits to the big, rambling, old fashioned house. My grandfather was a big, raw-boned Scotchman, 84 when I first remember him, who had run away from home as a boy and had many hair-raising tales to tell of his adventures in both the Mexican and Civil Wars. He was a civil engineer by profession, but had a wide Jack-of-all-trades ability. Among his many interests was a life long devotion to floriculture. He had mastered the art of budding and grafting and was amazingly successful in forcing plants into perfection of bloom. As a very young child I spent long hours with him among his beloved plants. Perhaps this constant association accounts for my own intense love of flowers, which must have developed at a very early age, for some of my most vivid childhood memories are recollections of my pleasure in blooming things.

In 1919, my family moved to Brownsville, Texas, where my father became Vice-president of the First National Bank. The young people accepted me generously as one of them and I became completely engrossed in the good time a small town offers a teenager. My high school education was divided between three different schools so that I might receive the four full years of Latin deemed necessary by my father. I

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am now very grateful for my knowledge of this important subject but deeply regret that my science courses suffered in the many transfers and I failed to receive even a basic course in Botany. What little knowledge of this subject I now possess has been of necessity self-taught and mainly confined to those families of plants which hold special interest for me.

In 1924 we moved once again to New Orleans—much to my distress; for my love of Texas had become very strong. I was to enter Newcomb College in the fall, but tragedy intervened. While I was still visiting in Brownsville my entire family nearly lost their lives in a terrible fire. My mother was seriously injured and her lengthy and costly illness drove all thoughts of college from my mind. When she recovered I secured a position with the New Orleans Public Library. About a year later, a vacancy occurred in the Sofie B. Wright High School and I was chosen by the school board to fill the position of Librarian, which I held until my marriage.

In 1927 I was married to Morris Walker Clint of Brownsville, Texas. My husband's family were well established in town, having come from East Texas in 1909. Our marriage has been an extremely happy one and we have been blessed with three children: Morris, Jr., Marcia Virginia and Alan Marc.

From the day we first moved into our own home, a newly built rent cottage on raw unlandscaped ground, we found our interest in gardening to be a mutual pleasure. Doing most of the work ourselves, we sodded the lawn, dug and planted flower beds and eventually built a small lath house for seedlings and pot plants. During this period we won the annual award of the local Civic League for ''the most improvement in home grounds.''

A few years later we moved into our own home. By now we were well beyond the kindergarten age in gardening and began to have ''growing pains,'' for we were no longer completely satisfied with the ordinary run of plants nor of our gardening knowledge. We subscribed to various gardening magazines, which we read avidly. As the nearest library of any size was several hundred miles away, we started our own botanical library. One of my proudest possessions was Bailey's Standard Cyclopedia of Horticulture which Morris gave to me for my birthday. Unlimited effort was spent in trying out various annuals and perennials in an effort to keep the garden pretty the year round. To fill the gap caused by the scarcity of perennials which would thrive this far north, we inevitably discovered the amaryllids and other bulbs. I believe we were the first in town to plant the *Amaryllis* and *Hemerocallis* hybrids of that period and the first to prove that *Agapanthus* could be made to bloom successfully in Brownsville.

When does a gardener become a ''collector''? Looking back, I am not sure just when this happened to us. Perhaps the inclination was always with us to some extent, but after we moved into our present home in 1945, several things completed the transformation. We acquired a large acreage with ''resaca'' frontage on the edge of town for a prospective homesite and soon found ourselves ''collecting'' material for future landscaping—mostly rare tropicals and exotics which we ordered from nurseries in this country and Hawaii. We joined the American Amaryllis Society and were so delighted with our first year book that we were not satisfied until we had a complete file of Herbertia, which I found a never-ending gold mine of information. We read of amaryllids we had never heard of before and were soon started on a ''collection'' of all available species and varieties. *Zephyranthes* became my special favorites, although the more spectacular Dutch hybrid *Amaryllis* caused a sensation in town. We made the acquaintance of an orchid grower and importer, Arthur Paul Summers, who had just moved to Brownsville from Panama. With Paul Summers help, Morris was able to realize a dream of many years—the growing of orchids. Soon we had a fine ''collection'' of botanical orchids, including many worthwhile species.

It is astonishing how quickly one runs out of space on even a large city lot. We purchased 2/3 of the empty lot adjoining us and built a lath house to hold our ever-growing collection of tropicals and bricked in a special patio for the orchids. Within a short time we had one of the finest assortments of tropical plants and botanical orchids in the south. The growing of orchids was quite a novelty in the Valley at that time and gave us a certain notoriety. A number of garden clubs from various parts of the Valley made ''pilgrimages'' to our home.

Unfortunately the freezes of 1949 and 1951, followed by two successive years of drought and water rationing took a heavy toll, not only of our plants but of our gardening morale when many plants and bulbs which had withstood the first hardships succumbed to toxic well water. In a way, perhaps our losses were fortunate, for it left us free for the rapid development of an interest which had started several years previously, in the fall of 1946, when Morris was asked to accompany Paul Summers on a jaunt into Mexico to collect orchid species. He came home with such glowing accounts of the beauty of that tropical mountainous country that a trip was planned for the ensuing spring, on which Mrs. Summers and I were to be included. Actually, two trips were made—in March and the latter part of April. These trips were destined to lead us into another ''collecting'' spree—only this time from the wild instead of from nurseries and catalogs. Certainly without them this article would not have been written.

Currently we are ''up to our ears''—with more projects going on than we can possibly keep up with. We are bending every effort to get our remaining rare plants transferred from pots into the ground at the farm, where they will be more easy to care for. Besides the thousands of *Zephyranthes* bulbs in the trial garden, there are even greater numbers of seedlings, many of which are still in pots and flats. The beds of the trial garden bulge with *Crinum* species and varieties, besides numerous species of *Hymenocallis* and *Hemerocallis* clones. We have started an *Amaryllis* breeding program and are still in the process of completing a large shade house in the country to better care for these and other seedlings: cycads, *Beaucarnea,* dwarf palms, amaryllids and other rarities from Mexico. I believe our ''collecting'' has finally caught up with us.

COLLECTING AMARYLLIDS IN TEXAS AND MEXICO

MRS. MORRIS CLINT, *Texas*

It is inevitable, I think, when one's interest in plants is at all extensive, that eventually a gardening hobby grows to include to some extent the collection of plants from their native habitats. For many years our own collecting was confined to the Lower Rio Grande Valley of Texas. Unable to travel very far when our children were young, we utilized small outings, picnics, hunting and fishing trips for plant scouting expeditions and successfully transplanting many of the wildings we happened upon.

When the Victoria Road, which connected Brownsville with the Pan American Highway at Cuidad Victoria, Mexico, was opened to travel, our business and home responsibilities had eased sufficiently to enable us to make several short trips a year into the upper part of tropical and subtropical Mexico. The wealth of vegetation and bewildering assortment of plant life we encountered there was a real bonanza to gardeners who had about run out of plants to order from even the more exotic nurseries and before the Mexican plant quarantine restrictions became severe we brought out and successfully propagated some fine tropical plant material. This included *Zephyranthes clintiae* and other miscellaneous *Zephyranthes, Zamia loddigesii* var. *angustifolia, Ceratozamia mexicana, Zamia fischeri,* (note: I am indebted to Dr. Velva E. Rudd, Associate Curator, Division of Phanerogams, Smithsonian Institution, for the determination of these three cycad species.) *Dioon edule,* and unidentified species of *Ficus, Peperomia, Agave, Monstera, Anthurium, Calathea, Plumeria, Heliconia, Maranta, Begonia* and various cycads, bromeliads and ferns. Several years ago, restrictions were lifted on seeds and on plants of a bulbous or tuberous nature, which fortunately includes the two classes of plants we now find so fascinating—amaryllids and cycads.

Our present intense devotion to the collection of amaryllids in Mexico has developed rather gradually over the years and actually had its beginning prior to the collection of *Z. clintiae* and other *Zephyranthes* in 1947. I shall endeavor to take the reader chronologically through the series of events which led us into our current absorbing fascination and report on those collecting trips which have not yet been covered in Herbertia.

In October, 1946, on his first trip into Mexico, Morris saw what he is still certain was a light blue *Zephyranthes* on one of the mountainslopes bordering the valley of Puerto de Lobos, in the state of San Luis Potosí. Only one flower was seen and although he followed the succulent stem for 5 or 6 inches below ground, he was forced to abandon the bulb when the stem entered a crack in the immovable rock below. I can still remember my disappointment when he told his story upon his return and admitted that he had failed to bring back either the bulb or the flower. With a full knowledge of just what such a discovery would mean to the amaryllid world, it is small wonder that we have never ceased to search for this problematical rarity. Indeed, for several years it occupied all our thoughts and we scheduled trips for various times of the spring, summer and fall in an effort to find the bulbs in bloom once more, for the lone blossom gave us no clue to the normal blooming date of the species.

Toward the end of April, 1947, we witnessed what we now know was a record bloom of *Zephyranthes* in the Puerto de Lobos region (Herb. 1952). After these bulbs bloomed again in our garden, I was prompted by Wyndham Hayward's article ''Diminutive Amaryllids'' (Herb. 1947) to write him of our discoveries—giving him a glowing account of what we had seen and of the variation among the bulbs we had collected. He responded with so much enthusiasm that I promptly sent him one of the red flowering forms. When this bulb bloomed for him, his own interest skyrocketed and he forthwith communicated the news to Dr. Traub.

During the summer of this same year, my son, Morris, Jr., brought home bulbs of a large and beautiful amaryllid he had found in bloom near El Sol, San Luis Potosí. This collection, our M-30, was subsequently determined by Dr. Traub as *Z. macrosiphon.* It was this collection which first opened our eyes to the fact that there might be still other *Zephyranthes* species well within our reach.

The publication in Herbertia of *Z. clintiae* as a new species in 1952 resulted in a lively correspondence with others who were also fascinated by *Zephyranthes* and other amaryllids: Fred B. Jones, Len Woelfle, Dr. Walter S. Flory, Jr., Thad Howard, Miss Willie May Kell. The enthusiasm of the writers and the wealth of information derived from this correspondence served to quicken our own growing interest, and directly resulted in starting us on an extensive study of our local *Zephyranthes* species. Beginning as an effort to locate or prove the existence of *Z. chrysantha,* originally described from collections near the town of Rio Hondo, Texas, about 30 miles north of Brownsville, our growing fascination for these little bulbs led us over the entire Lower Valley, including Cameron, Willacy, Hidalgo and Starr counties. We were astonished to learn that by far the greatest concentrations of the yellow flowering *Zephyranthes* species in the Valley were to be found virtually within the city limits of Brownsville, although we have collected them as far west as Rio Grande City (Fred Jones collected *Z. pulchella* in Webb County, near Laredo), in and near Rio Hondo, and almost to the coast—near Bayview. We paid a visit to Robert Runyon, discoverer of *Z. smallii,* and saw this species in bloom in his garden. Though Mr. Runyon's notes revealed that he had collected his original bulbs near Progreso, some 30 miles away, we learned that *Z. smallii* is now found in abundance only in and near Brownsville. In our several years study of the local species: *Z. pulchella, Z. smallii* and *Z. brazosensis,* we learned much of their behavior and formed many opinions of their apparent still active evolution. There is an astonishing amount of slight but noticeable variation—not only from field to field but even within the same field. As for *Z. chrysantha,* which supposedly differs only slightly from *Z. citrina* and *Z. pulchella,* I can only say that if it exists, it will surely be found somewhere in our collections. Numbered samples of the major variations of both Zephyranthes and Cooperias collected over the Valley were sent in to Dr. Traub and others for trial and study and the same bulbs planted in our garden for our own study. One of these numbers, T 56, a large and lovely yellow Cooperia, has proved to be outstanding in size, beauty and performance in the garden. A real Find!

Meanwhile, Fred Jones had long been busy with the *Zephyranthes* species of his own neighborhood. His enthusiasm and successfully active field work encouraged us to visit him during their blooming season. On two occasions—in the fall of 1952 and 1953—we collected along the way from Brownsville to Corpus Christi and, with Fred as our guide, over the Coastal Bend area from below Corpus Christi to the mouth of the Guadalupe River. Here, we saw in bloom and collected in the wild: *Z. pulchella* in several variations, *Z. traubii, Z. jonesii, Z. brazosensis, Habranthus texanus* and a lemon yellow flowered *Zephyranthes* species, as yet unidentified, which Fred had discovered on an earlier field trip.

As a direct result of our mutual interest and mounting interest for *Zephyranthes,* we received several pleasant visits from Fred Jones and Thad Howard and in October, 1954 from Dr. Walter S. Flory, Jr. who came through Brownsville after a two weeks collecting trip in Mexico.

On our way to San Luis Potosi in April, 1953, there occurred an event which was to play an important role in the methods and course of our future explorations. On a chance ''hunch'', husband Morris found a most interesting white Cooperia, M-292, right in the middle of territory in Mexico we thought we had covered fairly thoroughly for years. This number bears a large and beautiful flower and seems to be somewhere between *Z. traubii* and *Z. brazosensis.* A stone's throw away, we collected a new form of pink *Zephyranthes* to add to our growing list of variations from this area. Though I have often felt the lack of a technical education, the regret is never keener than when confronted with the abundant variation found among the *Zephyranthes* populations in the 30 miles or so of mountainous territory from Naranja to Cuidad del Maíz. We have often wished for the opportunity of spending an entire season in this neighborhood in an effort to partially solve the riddles existing there, for even the variations in altitude and the extreme differences in soil, rainfall and general climatic conditions do not offer a completely logical explanation for the intensely active evolution which is no doubt still in progress.

About this time, friends brought us bulbs from the state of Mexico, collected near Ameca-meca, and spoke of seeing large pink *Zephyranthes* in the mountains north of Jacala, in the state of Hidalgo. Not long afterward, Thad Howard wrote us of collecting 4 distinct species of *Zephyranthes* on a single trip into Mexico in July, 1953. One can imagine how these various discoveries brought our collector's blood to the boiling point.

This brings us to the fall of 1953. We suddenly realized that we had actually covered very little territory in our travels over Mexico and had spent far too much time and effort searching for the elusive blue *Zephyranthes.* However, stubbornness prevailed on us to make one last effort to locate this phantom, so we planned a trip to Puerto de Lobos for October, the month the bulb was originally seen in bloom. It was also proposed to drive southward from Tamazunchale to look for various kinds of seed and perhaps find *Zephyranthes* in leaf. Sad to relate, the blue *Zephyranthes* still remains an unsolved mystery. Though we saw *Zephyranthes* in leaf by the thousands, not a single bloom did we find. Fall rains hampered us on the entire trip and when we arrived at Tamazunchale, we were told that the rains were exceedingly heavy in the mountains below and extended all the way into Mexico City. It rained all night and well into the next morning and we began to fear that we would be forced to abandon the rest of the trip, which had originally been planned as a two day journey to Zimapan, about 100 miles away. However, about 10 o'clock the weather cleared and we decided to drive to Jacala and return the same day. It was soon apparent that we knew little of this particular mountainous stretch, for we ran into heavy fog and light rain just a few miles beyond Tamazunchale. Landslides had been numerous and the debris often still covered the road. To make matters worse, we came upon two serious accidents of the night before. We thought often of turning back, for our unfamiliarity with the highway only added to the danger of the impenetrable fog, but the eagerness of our search and the hope that the fog would soon dissipate led us on. We made numerous stops along the way, but failed to find *Zephyranthes* foliage in the abundance of tropical growth of all kinds brought out by the summer and fall rains. We were fascinated by the wealth of bloom—strange vines, flowering shrubs and trees and numerous wild flowers. A sea of blue proved to be *Cynoglossum,* which has become naturalized along a portion of the roadside. We must have seen at least 4 distinct species of *Salvia*—one dark blue beauty fully 4 feet high. The houses on the mountainsides were colorful with *Dahlia,* roses, *Begonia, Impatiens* and other blooming plants. The double flowering white daisy tree had been freely used and was now a sheet of bloom in immense banks.

At last we came out in sunshine as we reached the backbone of the range, just a few miles north of Jacala. This is truly beautiful country —gently rolling and more open than the jungles above, with a few scattered oak and pine trees, carpeted like a lawn with low growing grass and abundant with wild flowers. We stopped at a particularly lovely place called Puerto de la Zorra [Fig. 1] for lunch, mainly because it had the definite look of *Zephyranthes* territory. Sure enough, we found them in leaf just a few feet from the car. Our lunch was almost forgotten when we discovered that there were two distinct species—small bulbs which grew in clumps and had very narrow, slightly glaucous leaves which were in full growth and larger bulbs with very broad leaves which were rapidly going dormant. Although both were unfamiliar to us, we found the larger bulbs most intriguing and unusual and even wondered if they actually were *Zephyranthes.* These discoveries placed a new significance on our rapidly enlarging conception of the *Zephyranthes* species of Mexico and made us long for spring and the return of the blooming season.

On the way home, we visited L. E. Guerra, a plant lover and collector, at Tamazunchale, San Luis Potosí. We wished him to secure for us bulbs of a particular *Hymenocallis* species grown to some extent in gardens over town. The *Hymenocallis* is a very beautiful one, belonging to the group with broad bladed, petioled leaves and the crisp, heavy textured flowers remain in good condition for several days. A number of years ago, we had acquired a small offset from a plant in one of the tourist courts in Tamazunchale. The bulb had grown well and flowered, but failed to set seed or form offsets. Of course, the talk soon turned to *Zephyranthes.* Mr. Guerra remembered seeing a few large white flowers and promised to bring us bulbs of these and to look for the *Hymenocallis,* also. When he arrived, about a month later, we were delighted,—for he brought us an unidentified pink species of *Zephyranthes* he had found in some abundance along the banks of the Rio Moctezuma near Tamazunchale, our number M-375, and bulbs of a species of *Hymenocallis,* M-374, which he had collected along the sandy banks of a river in the Isthmus of Tehuantepec. These prizes somewhat compensated us for his failure to locate the white flowering *Zephyranthes* (which he told us were never in great abundance) and the desired species of *Hymenocallis.*

Meantime, our Texas species were not forgotten. Miss Kell had sent us bulbs of *Z. longifolia,* collected for her in the Davis Mountains, but these had failed to bloom for us for we did not have a favorable place for them. However, during the fall and winter of 1953-54 we had cleared and prepared ground on our property in the country for a good sized trial garden to plant our growing numbers of *Zephyranthes* and other amaryllids. Reports of heavy rains in West Texas in mid-April decided us to make a trip to that area in hopes of finding *Z. longifolia* in bloom. As usual we made frequent stops along the way, looking for possible *Zephyranthes* and collecting various desert plants—*Yucca, Dasylirion, Nolina, Agave* and *Hesperaloe.* A few miles west of Del Rio, we were thrilled to find *Z. drummondii* D. Don in bloom—our first glimpse of this species in the wild—and were surprised at how much they varied from the form we had long grown in our garden. We were delighted to find several stands of *Allium coryi* in bloom on the rocky ledge above the highway a few miles north of Ft. Davis and brought home enough of this beautiful little yellow flowered species to share with others. It was another "first" for us. So far, we had seen no sign of *Z. longifolia.*

There had been almost no rain beyond the eastern slopes of the mountains and we began to doubt that we would find this species in bloom—perhaps not even in leaf. In fact, we would definitely have come home empty handed if our stubbornness and persistence had been any less. We found a few bulbs along the roadside just north of Ft. Davis and eventually discovered a heavy concentration of bulbs just peeping out of the ground in one of the broad, low valleys on the western side of the mountains. We were still not certain of just what we had collected, however, for Miss Kell had written that a small Cooperia species was also native to this area. Fortunately, we were not kept long in doubt. About 40 miles west of Ft. Stockton we drove through country which had received heavy rainfall and along the roadside and in the shallow ditches we found a few clumps of what must certainly be *Z. brazosensis* and the same little bulbs we had collected earlier. Buds on the latter were already showing color and a few days after our arrival home, we were treated to our first glimpse of *Z. longifolia* in bloom. After this comewhat difficult accomplishment, perhaps we can be pardoned if our confidence arose in our ability to locate *Zephyranthes* in strange territory.

Therefore it seems plausible that we started on the historic trip of May, 1954, on which we were accompanied by Fred Jones, with an optimism which was at least partially justifiable. We had acquired many good collecting habits and a fair knowledge of how and where to look for *Zephyranthes.* We had learned to take exact mileage data wherever we found bulbs of any kind, which proved of immeasurable value when the same territory was covered again—not only in locating former collections, but often in discovering new forms and species hitherto invisible to us, for we had learned that for every bulb seen above ground there are usually hundreds or even thousands still dormant and unsuspected below the surface. On this and subsequent expeditions we

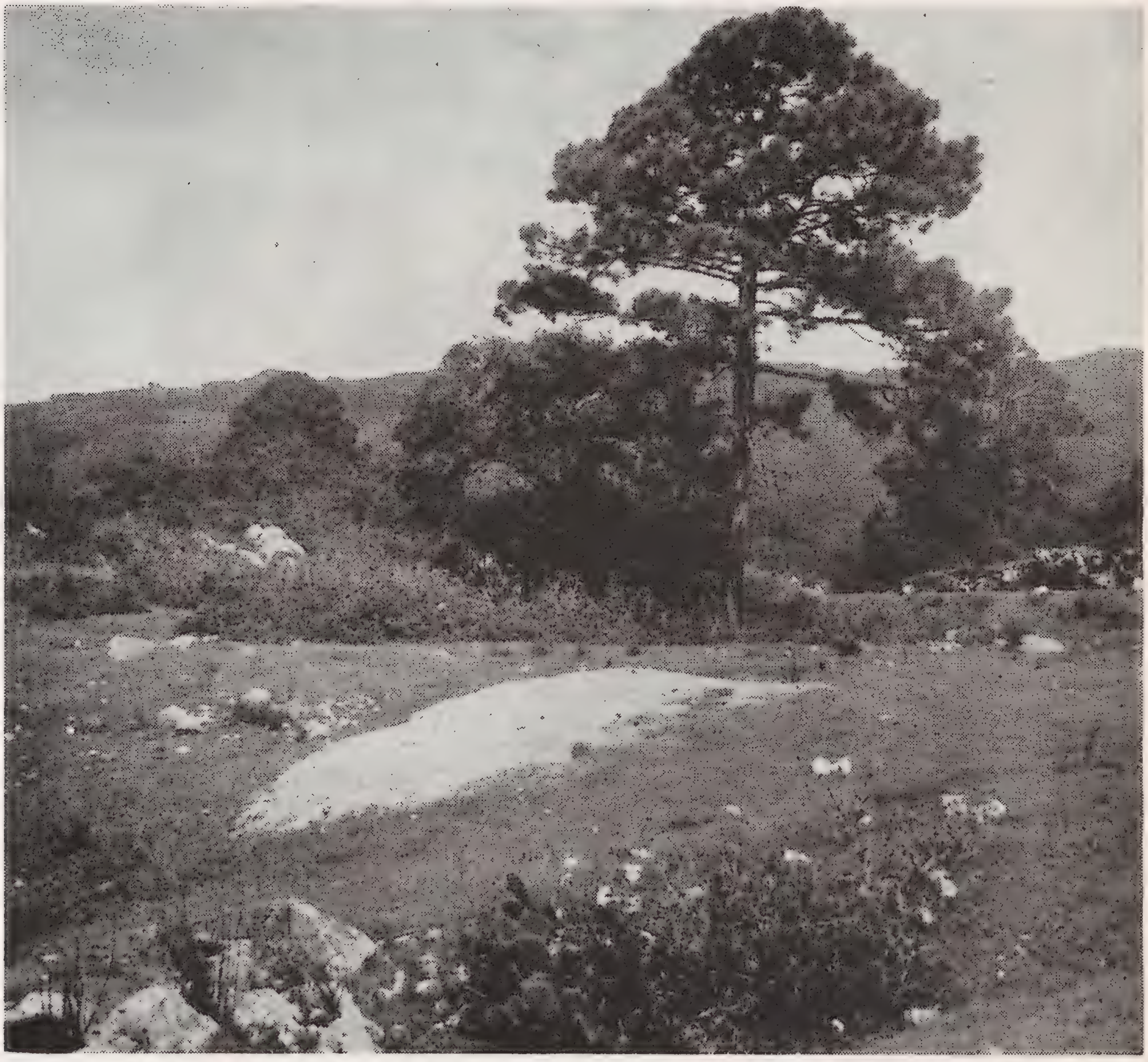


Fig. 1. Habitat of *Zephyranthes* spp. M-449, M-565, M-569 and M-618—Puerto de la Zorro, approx. 7 mi. north of Jacala, Hidalgo, Mexico. Photo Clint, 10-5-53.

found out that the statement that I had made several years earlier "all Mexico is paved with *Zephyranthes*" was more literally correct than even we had imagined. As this trip has already been reported in Herbertia 1955, I will only add that after this unbelievable success, the Clints were now completely dedicated to the search for *Zephyranthes.*

Since we felt that we had been cheated out of possible discoveries in territory south of the immediate San Luis Potosí area because of the delay in the seasonal rains, we planned another trip in July of this same year. Our route took us on the Pan American highway to El Mante, Tamazunchale and Zimapan; westward on highway 45 through the states of Hidalgo, Queretaro and Guanajuato to Leon; north and eastward on highway 80 to San Luis Potosí, Cuidad del Maíz, Antiguo Morelos and home again. Though we were not to find many *Zephyranthes* in bloom, we had a fabulously successful trip. On the first day, just before entering the town of El Mante, in the sugar cane country, we saw golden yellow *Zephyranthes* which strongly resembled our Texas species in a shallow ditch along the roadside. For seven years we had sought bulbs in this same territory and had failed to find them—either in leaf or in bloom. Nor have we seen them since, even though we have thoroughly examined this self-same location on and near the same time of year,—all of which shows clearly the elusiveness of many species of *Zephyranthes.*

The next morning we were fortunate in finding in bloom the same light yellow *Zephyranthes* species discovered by Thad Howard a year earlier, and were told that the species was to be found in some abundance in low ground from Cuidad Valles to Tamazunchale. We actually saw them blooming in three widely separated spots, including Thad's original collection site. Not long after entering the state of Hidalgo, we were enchanted when we came upon a hillside covered with the lovely form of *Z. macrosiphon* we have carried for some years under our number M-30. It was our first sight of these bulbs in the wild and we were deeply impressed with their size and beauty. I believe Thad had collected this species the year before, probably in the same general neighborhood.

At Puerto de la Zorra, we found in leaf the same two species we had seen the past October, the small bulbs heavily in seed. Just beyond Jacala, I caught a glimpse of a large white Zephyranthes on the ledge above us. Morris thought I was joking and by the time I convinced him by my excitement that I was not, the white blossom was completely out of sight. Before us, however, was a rocky hillside covered with yellow *Zephyranthes.* The peak of bloom had been several days earlier and there were many ripe seed capsules from a former blooming. Several of the flowers were fresh enough for us to tell that we had found a small yellow *Zephyranthes* with quite a long tepaltube, No. M-449. Both bulbs and capsules were so similar to the ones collected north of Jacala, No. 446, just 8 miles or so away, that we quite naturally assumed them to be the same. Our first hint that these collections were a mixture of forms came when one bulb of each number bloomed shortly after our arrival home and unexpectedly proved to be light yellow heavily flushed with red, both within and without. The behavior of the seedlings was very mysterious, for those of No. M-446 stayed tiny and threadlike while

M-449 grew fast and lustily. It was not until the following year that we were able to completely unscramble these several collections from the Jacala area. But that is ahead of my story.

On the way from Zimapan to Leon, Guanajuato on highway 45, we found a few *Zephyranthes* in leaf at several stops, but it was at once apparent that we had missed the main *Zephyranthes* bloom in this area, for rainfall had evidently been abundant for some time. In the western edge of the state of Hidalgo, we came upon masses of *Allium* in full bloom—a small bright species, somewhat similar in coloring to *A. drummondii.* Here, also, we saw our first *Milla biflora.* All in all, our col-

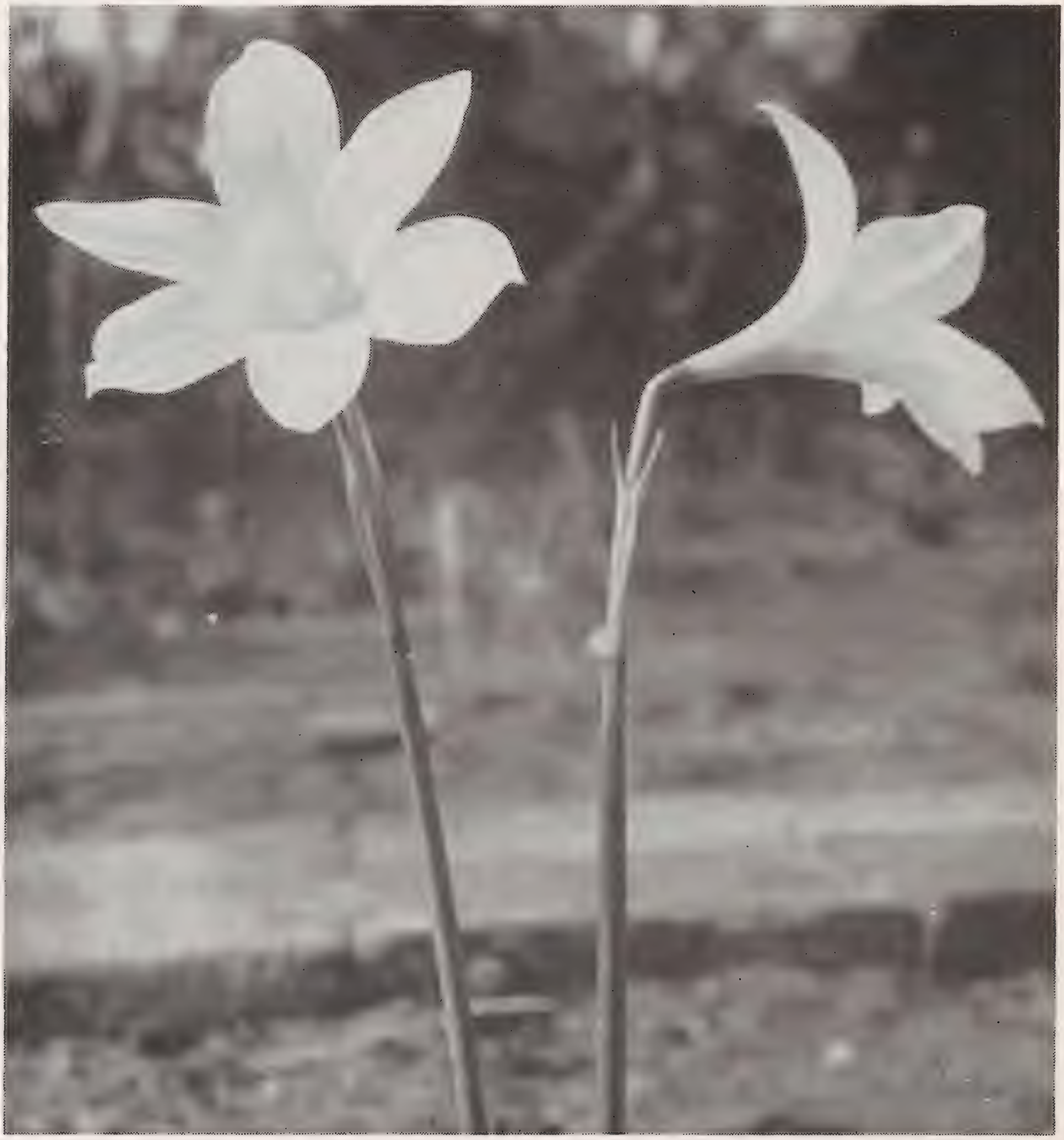


Fig. 2. *Habranthus* immaculatus Traub et Clint *sp. nov.* [M-456], as grown in the Clint trial garden, Brownsville, Texas. Blooms in second day after opening; scape 14 inches tall, flower 3½ inches across face. 2/3 natural size. Photo by Clint.

lecting was poor and left us unprepared for a most important discovery in the state of Guanajuato. This collection, No. M-456, represents one of those lucky breaks (we have had many of them) which are sorely needed when one collects along the roadside, as we do, with many miles to cover in a single day. Though we were pessimistic over our chances of finding bulbs along this route at the present time, when we came upon a ridge which was covered with an old ''Tuna'' plantation, it looked like such a promising home for *Zephyranthes* that we decided to give it a quick survey. To save time, we separated—each taking a different side of the road. I found a large stand of bulbs some distance away, dug a few and went back to the car to brag—to find that the laugh was on me, for Morris had found the same bulbs just off the highway on the opposite side of the road. We assumed them to be magnificent specimens of *Z. concolor* because of their similarity to that distinctive species and were pleased to have placed them in the state of Guanajuato. There was not a sign of even an old bloom scape—which we thought odd—and the bulbs were in full, luxuriant growth, often in huge clumps, which was also unusual for *Z. concolor.* The soil was a mellow clay loam with bountiful moisture content, which no doubt explained the phenomenal growth, but still we were astonished at the size of some of the bulbs, which were a good 3 inches in diameter, with leaves an inch or more across. We were not to discover our mistake in the identity of these bulbs until several scapes appeared in our trial garden the following year and they proved to be by far the most beautiful of all the bulbs we have so far collected—a truly immense blossom of pure white with a rich yellow throat. After careful study by Dr. Traub and the writer, M-456 was recognized as a new species, *Habranthus immaculatus* [Figs. 2 & 3], and it is published elsewhere in this issue of HERBERTIA.

The next day was to have its thrills, also. Less than 20 miles from Leon, but in the upper corner of the state of Jalisco, we were entranced by a large field which was solid white with *Milla biflora.* We left the car to take pictures of this gorgeous sight but became so excited and busy with what we found when we had walked a little ways into the field that it was not until we were once more on our way that we remembered that we had failed to get a single photo. We promptly named this place our ''Bulbous Paradise'' for among the blooming Millas we saw two distinct species of *Oxalis*—one bright red and one lavender—a tiny, dark blue irid, a small *Chlorophytum* species with spikes of large white flowers and very ruffled leaves, a tiny *Anthericum* with lemon yellow flowers, an unusual bulb which appeared to be closely related to *Tuberose* and a few *Zephryanthes* bulbs with almost fully ripe seed capsules, M459. The capsules appeared to be sessile and the stiffly upright, slightly glaucous leaves were very similar to my own seedlings of *Z. fosteri.* With the added fact that we were in the state of Jalisco, we immediately jumped to the erroneous but perhaps pardonable conclusion that we had fortunately stumbled on *Z. fosteri.* When the bulbs leafed out at home, our doubts arose concerning our tentative identification and the bubble finally burst when the bulbs bloomed the following April. Such is the tantalizing fortune of collecting bulbs in leaf and perhaps we shall one day learn not to jump to false conclusions, for bulbs in the wild can often present an entirely different appearance in leaf, bulb and flower from those bloomed under cultivation—or even in the wild at different periods or seasons. In searching for more bulbs of M-459, we discovered still another distant species of *Zephyranthes,* growing in some quantity along a low wash filled with milky white water. This number, M-460, was mistaken at a distance for *Z. concolor* and we were delighted to place this species in the state of Jalisco, but as we approached closer we saw that the broad, slightly twisted leaves were a bright, shining green and the few dried and open capsules were apparently sessile and very small, as were the bulbs, for such a massive display of foliage. A year later we were lucky enough to find a few flowers on both of these bulbs. Apparently, M-460 is the first to bloom and has a full, roundish flower of white, heavily flushed with pink. M-459 blooms later and has an open, star-shaped flower with narrow tepals of deep pink. The ovary of neither is completely sessile. It might be interesting to report on the strange soil structure we found when we dug these bulbs. The upper two inches or so was a light sandy loam, below this was 3 or 4 inches of coarse, very sharp sand. The bulbs themselves were in this sand, with roots deeply imbedded in a heavy clay soil beneath. All was completely saturated with moisture, which added to the difficulty of digging the bulbs without injury.

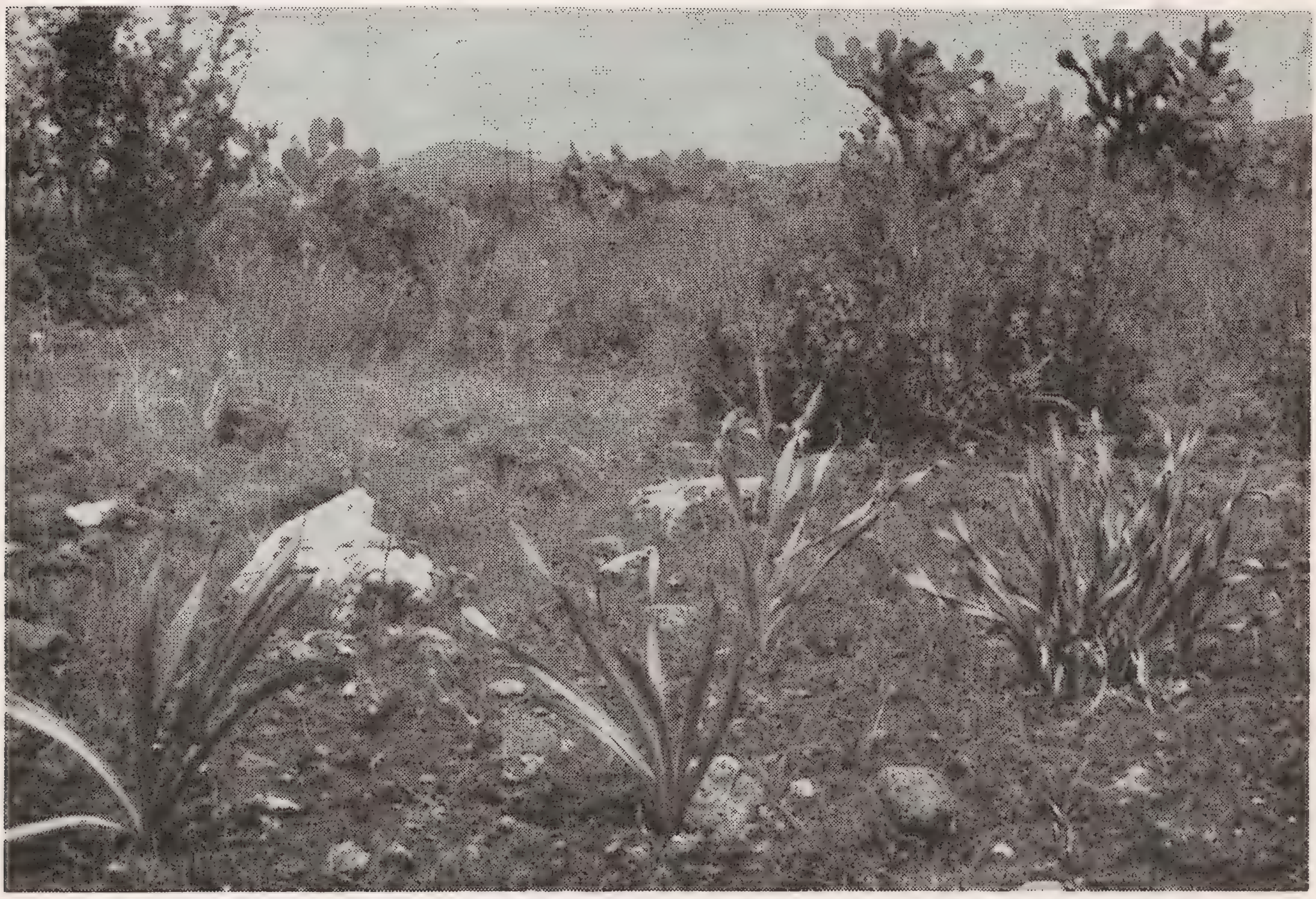


Fig. 3. Type location of *Habranthus immaculatus* Traub et Clint, *sp. nov.* [M-456], about 24 mi. east of Celaya, Guanajuato, Mexico, 8-2-55, showing leaves about 12 inches tall. Photo by Clint.

As we turned north on highway 80, we were almost immediately aware of the contrast of the dry, desolate landscape with the area we had just left. We re-visited all of our former collection spots but found little of interest to report. On one ridge M-428 had just bloomed, while less than 2 miles away, on the next ridge where we had collected M-426, there was hardly a bulb above ground and masses of pale pink *Allium* had taken their place. One or two bulbs of a large flowered *Allium* species with glistening white blossoms were collected, but we were too early to find them in any quantity.

We had planned to search carefully on the plateau above San Luis Potosí for the large white ''Mananica'' we had been told about in May, but found nothing unusual—in fact, all the plants but *Z. concolor* had disappeared under ground once more. We collected a lavender and white *Allium* species in one locality, but most of the territory was dry and barren of bloom. We stopped once to investigate bright coral panicles of bloom as we passed through that part of the desert plateau which supported quantities of *Hechtia,* to find that a species of *Echeveria* was present in some abundance—snuggling under the protection of the thorny clumps. As we approached the mountains just west of Cuidad del Maiz we noticed signs of recent shower activity, but even so we were completely unprepared for the mass of ''Mayitos'' which greeted us as we rounded a bend in the foothills. The bulbs were present in some abundance among the large clumps of *Hechtia* and, strangely, the soil was of good quality—apparently of volcanic origin. To date this locality holds a record with us for being the most fantastic spot one can imagine finding *Zephyranthes.* The bulbs bore evidence of extreme drought conditions, for they were insulated with the heaviest quantity of dry slough-

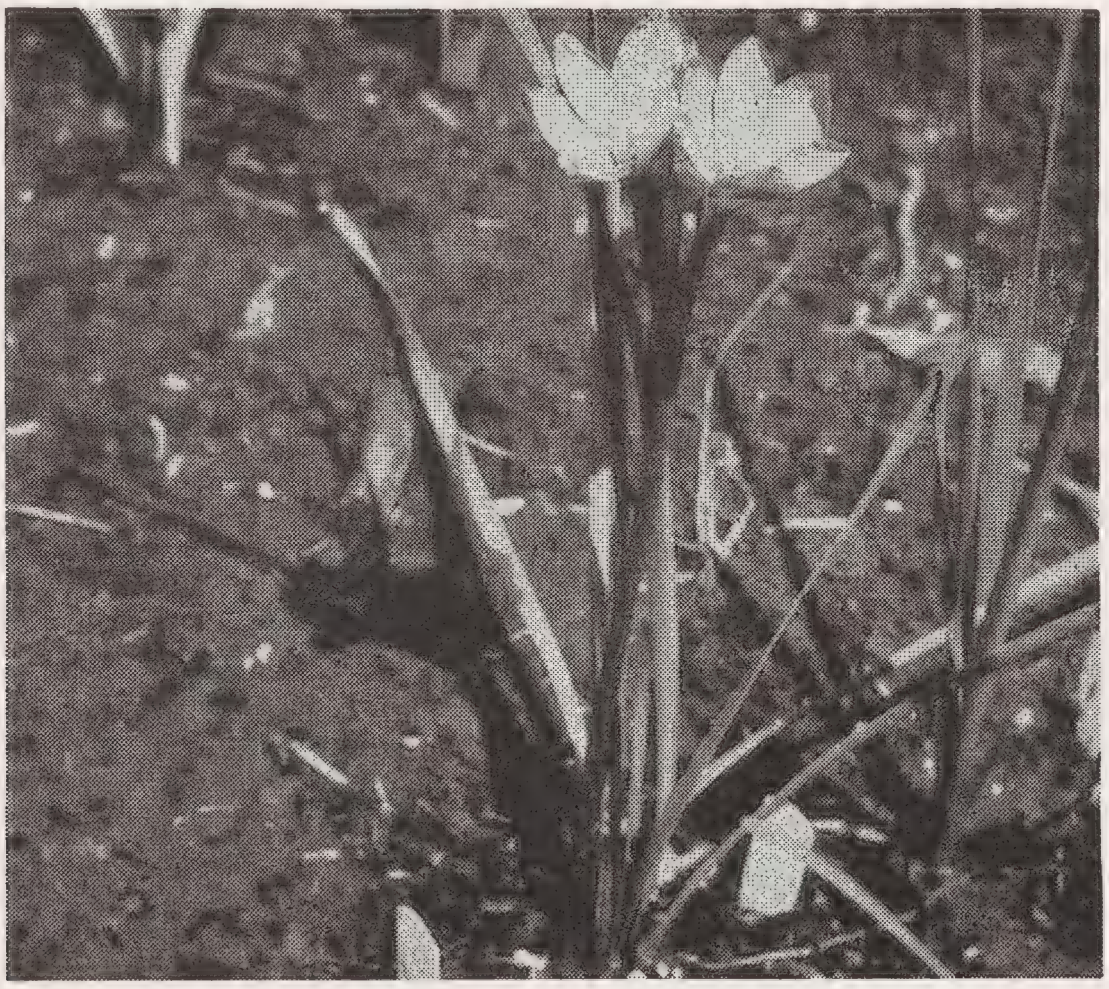


Fig. 4. *Zephyranthes* sp. M-244, from Canon de Borrego, San Luis Potosi, Mexico. Two-flowered individual scape; in Clint trial garden; scape 9″ tall; flowers dark rose-red. 8-19-55. Photo by Clint.

ing coats. The leaves were narrow and slightly glaucous and the flowers were white, heavily flushed with pink—so heavy in texture that they were actually stiff—and were borne on a very long pedicel. This is a perfect example of the part played by environment, for when the bulbs bloomed the next year in our trial garden, the heavy texture was gone and so was the color. Though entirely different from them in the wild, this collection, M-469, is close enough in form to be called a dowdy sister of the lovely M-412, collected on a caliche outcrop about 40 miles north of San Luis Potosí in May.

In May of 1955, we again took a trip into Mexico accompanied by Fred Jones, and again luck rode with us, for we were not far from the main highway on the road to San Luis Potosí when Fred spied *Zephyranthes* blooms in the roadside ditch in the broad valley near Nuevo Morelos. They were a large pale yellow flower very similar to Thad's Cuidad Valles collection, differing only slightly in form, coloring and leaf character. In the mountains beyond, we found *Zephyranthes* in two colors: white flushed with pink and a bright purplish red. I noticed that the majority of the red flowers were abnormal in an odd fashion, for they had only 4 tepalsegs, a two pronged stigma and two locule seed capsules. We have collected other forms from this same general neighborhood which frequently have an extra complement of tepalsegs, four lobed stigmas and capsules. Last year a real oddity appeared in our garden—a twin-flowered scape on No. M-244 [Fig. 4]. There were more blossoms on the western edge of Canyon de Borregos, large, narrow

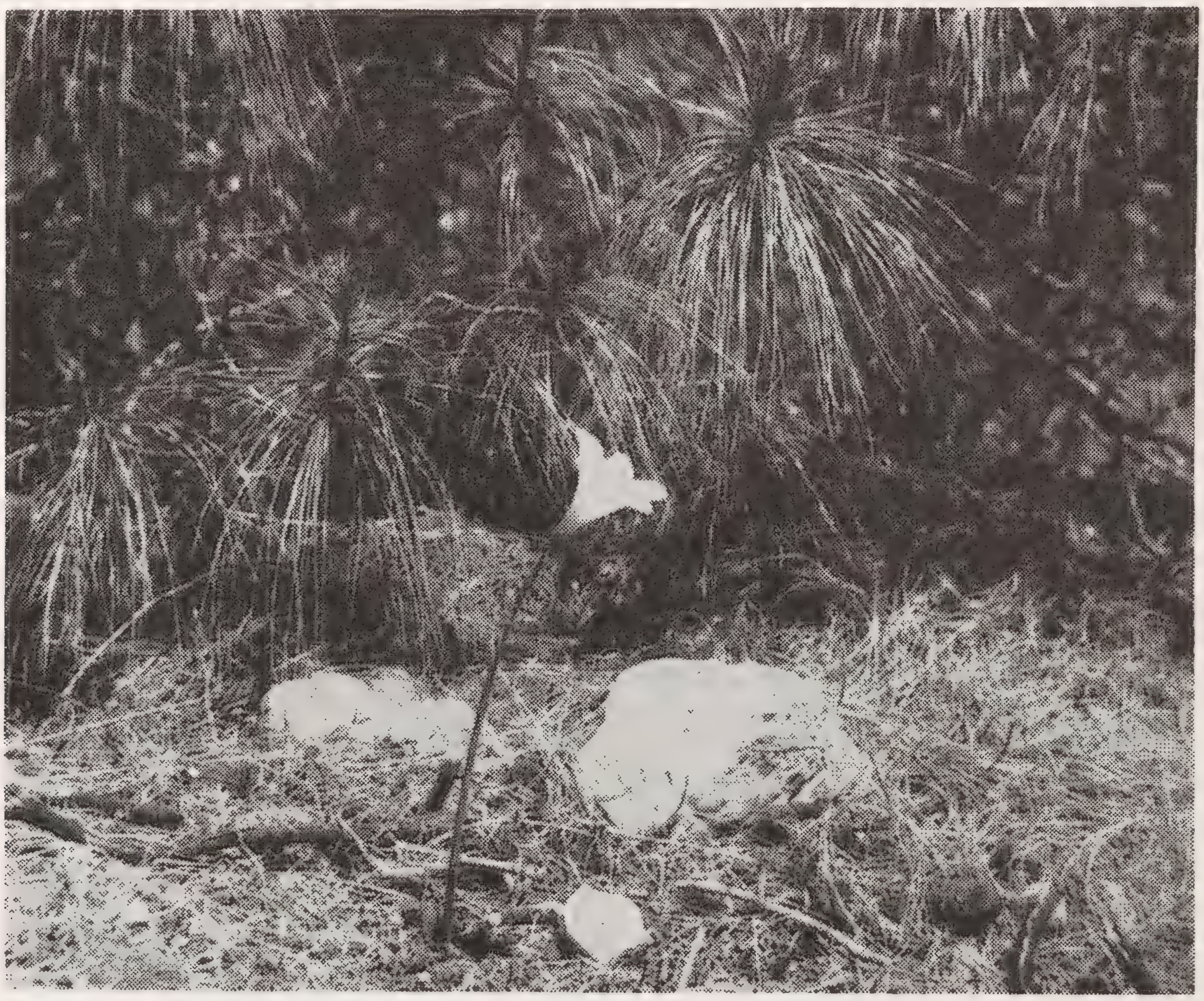


Fig. 5. *Zephranthes* sp. M-565 (= M-445), 20 mi. north of Zimapan, Hidalgo, Mexico; also collected at Puerto la Zorro (M-445). Scape about 18″ tall, flowers white, heavily flushed with pink. 5-20-55. Photo by Fred B. Jones.

segmented rose blossoms which seemed to dwarf the tiny bulbs which bore them.

On the plateau near San Luis Potosí, the rains were late and the few bulbs we saw in flower were inferior in quality because of insufficient moisture. Disappointingly, the drought extended southward and along highway 45. Our "Bulbous Paradise" in Jalisco and the Tuna plantation in Guanajuato were bare and dry and not a single bulb above the ground. We were far behind our time schedule when we passed through the state of Queretaro and almost missed the masses of dainty pink *Zephyranthes* in bloom along the roadside. Conversation with an old woman who passed as we were digging the bulbs disclosed that there were other bulbs in the same location which bloomed later. These bulbs were "mas claro" in color and were much used for stomach troubles by the local natives. So, as usual, we find what is true in almost any given location—there is rarely only one form of *Zephyranthes* present.

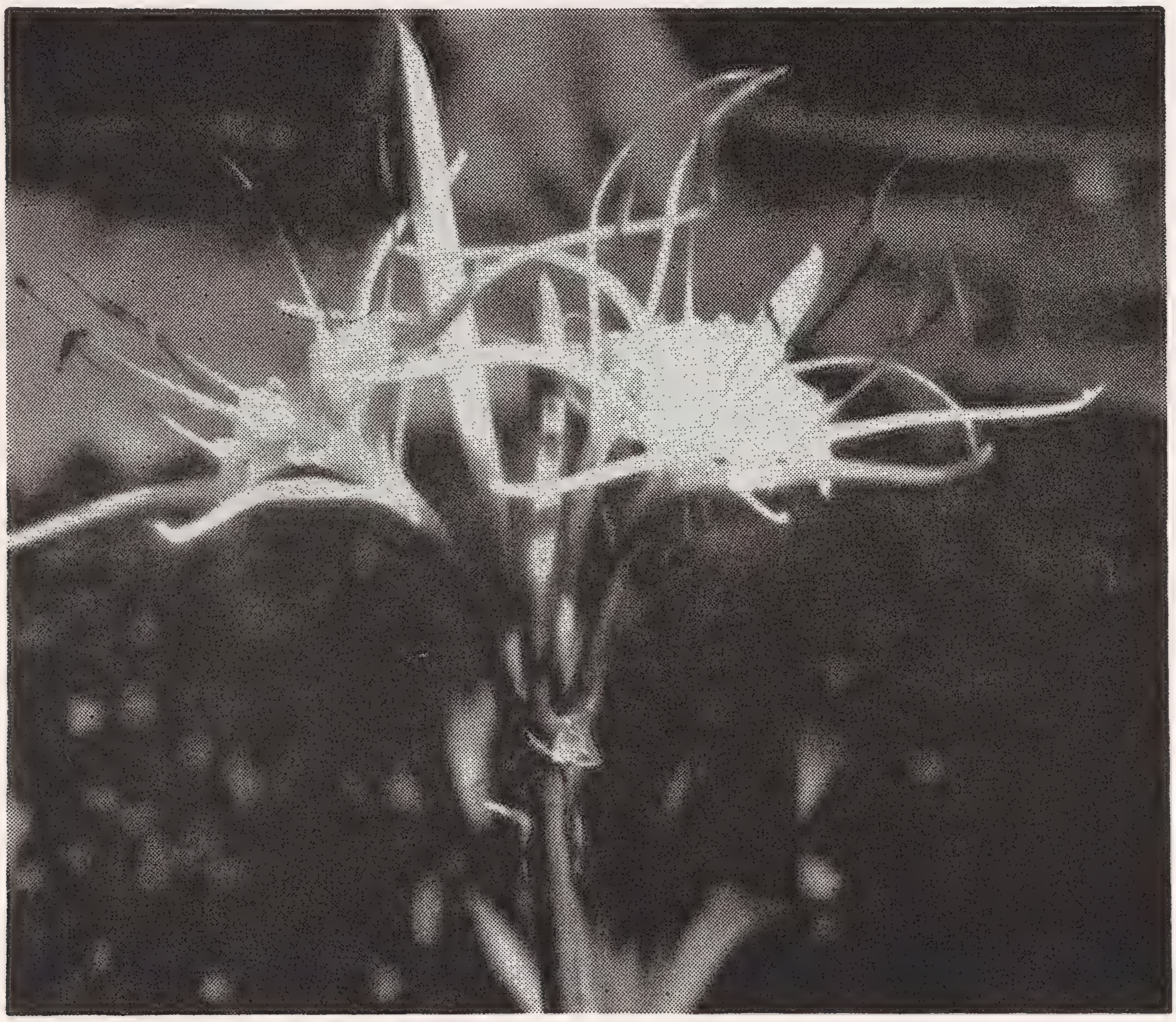


Fig. 6. *Hymenocallis* sp. M-604, south shore of Lake Chapala, alt. 6300 ft. Bloomed in trial garden Brownsville, Texas, 6-19-55, narrow glaucous leaves. Photo by Clint.

The next day was to prove an important one, for we were to solve several of our former collecting riddles. We had traveled less than 20 miles from Zimapan when I spied a large *Zephyranthes* blossom on the rocky shelf above us. When we got out to investigate, we saw that there were two forms—one [M-565-A] pure white and the other [M-445 & M-565] white, heavily flushed with pink [Fig. 5], somewhat similar in

[COLLECTING AMARYLLIDS—Clint, continued on page 83.]

1. REGIONAL ACTIVITY AND EXHIBITIONS

AMARYLLIS EVANSIAE IN HONOR OF MRS. U. B. EVANS

CLAUDE W. DAVIS, *Louisiana*

A new species of yellow *Amaryllis* from Santa Cruz, Bolivia was officially announced and named "*Amaryllis Evansiae*" in Alexandria, Louisiana on February 4, 1956, at a banquet given in honor of Mrs. U. B. (Jo) Evans, Ferriday, Louisiana, who received the Annual Award of the Horticultural Travel Foundation, Inc., New York City. These two events, the discovery of a new species of yellow Amaryllis, and the selection of Jo Evans as "The Woman Who Has Done The Most For American Horticulture in 1955", are so closely interrelated that the story would be incomplete to relate them separately.

One of Mrs. Evans' numerous activities which resulted in her selection by the Horticultural Travel Foundation, was the organization of the Louisiona Society for Horticultural Research. Under her leadership this organization promoted a plant exploration trip to Panama, Columbia, Ecuador, Peru and Bolivia for the purpose of collecting native flora which might be of horticultural value in Louisiana. Her daughter, Mrs. Donald V. Applegate had lived for seven years in Santa Cruz, Bolivia, and it was through visits to Marianna that Mrs. Evans learned of the many rare and beautiful native plants which flourish in the mountain valleys of the eastern slopes of the Andes Mountains.

Professor Ira S. Nelson, Horticulturist, Southwestern Louisiana Institute, Lafayette, La. was selected by the Society to make the trip to South America. He left on August 1, 1954 and collected plant material in all of the aforesaid countries. A total of over 900 bulbs and other plants were brought back to Louisiana. Most of the plants were amaryllis, but the collection also included orchids, bromeliads, Crinums, Zephyranthes, a Jacaranda considered to be hardy in the Southern States, a red passion flower and other miscellaneous trees and vines. Professor Nelson states:

"The most exciting find was a series of variations resembling *A. belladonna* in most characteristics except color and color pattern. Some few of these were growing with belladonnas, but most of them were not found close to typical belladonna populations. The range of color variation extended from a cream white to pale yellow. Most of them developed a pink blush after opening. Some exhibited green throats, others yellow throats. A few clones had a pink outline of a star in the throat. The flowers of only one clone had stigmas distinctly trifid. All others had an obscurely 3-lobed but capitate stigma.

"The habitat in which this series was found growing varied from 500 to 2000 feet in elevation and from sandy, open plains to accumulations of almost pure leaf mold deposited on the mountain sides. A few clones were growing in full sun, but most of them were found growing in rather dense shade in deciduous jungle. The soil was always light and well drained.

"Due to the day-to-day color change of these blushing *Amaryllis* I could never be sure whether I was seeing a new one or a different color phase of one already collected, but I am confident that I brought back at least a dozen that are distinctly different.

"The blushing *Amaryllis* from Santa Cruz justified the entire trip. They are delicate of color, graceful of form and of a size that should be useful for both garden and cut flower purposes. Certainly they are a new departure from the *Amaryllis* known in the States."

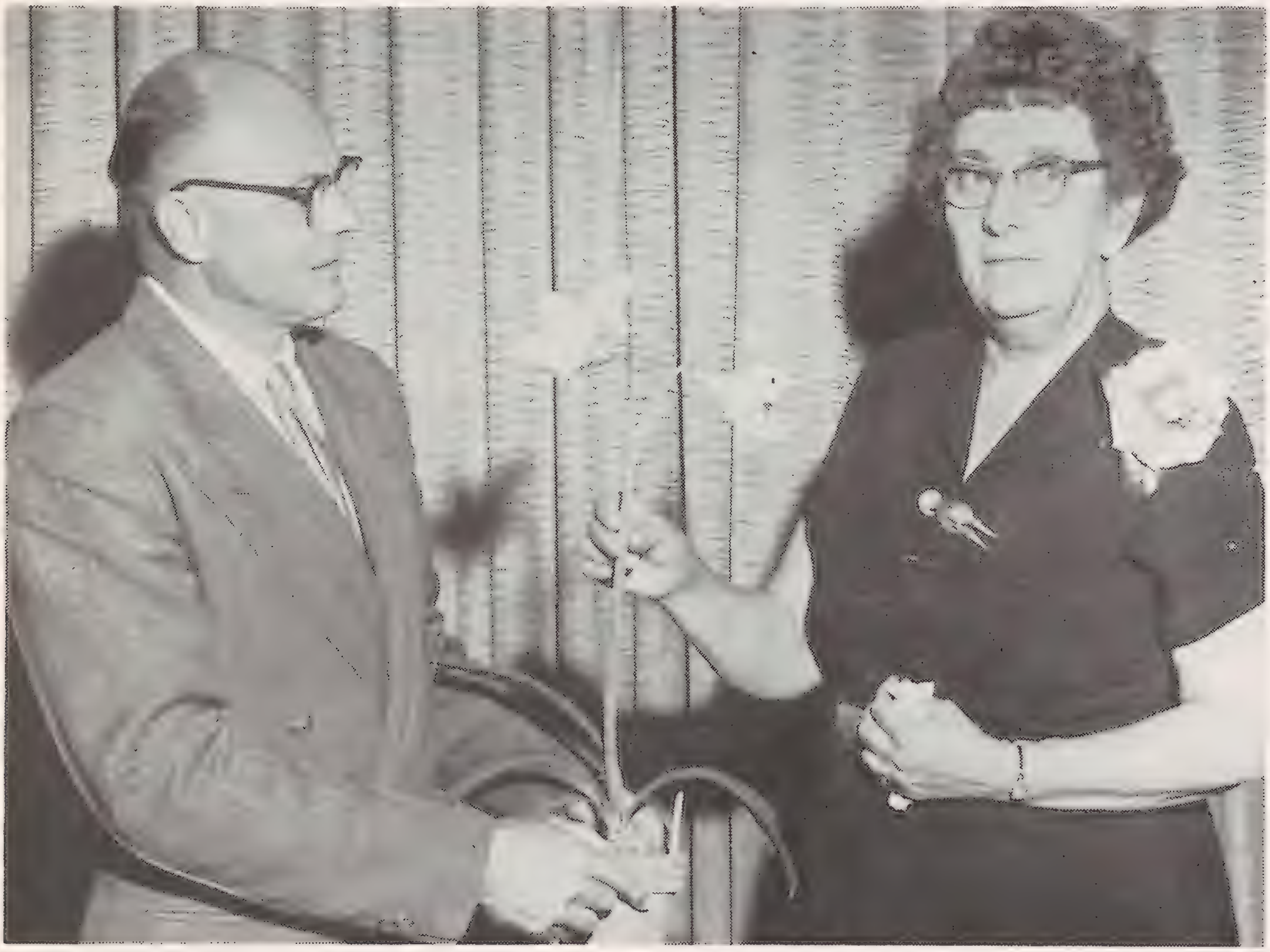


Fig. 7. Mrs. U. B. Evans receiving a flowering plant of *Amaryllis evansiae* Traub et Nelson at the banquet, Febr. 4, 1956, at Alexandria, Louisiana. Photo Alexandria (La.) Daily Town Talk.

The telegram announcing the name of this new species was read at the banquet in the Hotel Bentley and Mrs. Evans was presented with a potted plant of *A. Evansiae* in full flower. The message was as follows:

La Jolla, California,
Feb. 3, 1956.

"Mrs. U. B. Evans and Mrs. Marianna Evans Applegate,
Hotel Bentley,
Alexandria, Louisiana.

In recognition of your foresight and determined efforts in connection with bringing new Amaryllis breeding stock to American horticulture, the yellow Crucenian Amaryllis, which is a new species to science, shall forever bear the name *Amaryllis Evansiae.*

(Signed) Hamilton P. Traub and Ira S. Nelson.''

Mr. Adrian Frylink, Director, Horticultural Travel Foundation, presented Mrs. Evans with the annual award of the Foundation. It consists of a 38-day tour to historic and interesting garden spots in England, France, Belgium, Holland and Germany. In his presentation speech Mr. Frylink expressed the belief that the secret of Mrs. Evans' success as a horticultural leader is because with every seed, every scion, every bulb and flower that she gives away, she wraps a little bit of Jo Evans in the gift.

Nomination for this award was made by the Louisiana Garden Club Federation, with Mrs. Robert Ehrhardt (of Shreveport, Louisiana), serving as chairman of the Nominating Committee. The selection of Mrs. Evans was from among 1,100 nominees in 41 states on the basis of research, plant breeding and plain ''dirt gardening.'' In addition to being an excellent gardener, Jo Evans has earned distinction as a writer for horticultural journals, a lecturer to garden groups, and a past president of the Louisiana Garden Club Federation. While president of this organization she established a scholarship fund for research in floriculture and ornamental horticulture, and she was largely instrumental in securing from the Louisiana Legislature the original appropriation to establish floricultural research at the Louisiana State University.

The banquet honoring Mrs. Evans was sponsored by the Federated Garden Clubs of the Eighth Louisiana District, with Mrs. Homer H. Harris of Alexandria serving as chairman and toastmaster. Mrs. Harris is Advisory Chairman, Louisiana Garden Club Federation and a Member of the Board, National Council State Garden Clubs. The several hundred guests who were in attendance represented gardeners and flower-lovers from the entire state who had assembled to pay tribute to one whose accomplishments have received national recognition.

Among the speakers who told of Jo Evans' work and praised her achievements were Mrs. N. P. Martone, Iowa, Louisiana, President of the Louisiana Garden Club Federation, Mrs. Lewis M. Hull, Boonton, New Jersey, Past President, National Council of State Garden Clubs and now Associate Editor of the magazine, ''Flower Grower'', Mrs. Robert Ehrhardt, Shreveport, La., Chairman of the Nominating Committee, and Mrs. Walter Colquitt, Shreveport, Louisiana, who received the Annual Award of the Horticultural Travel Foundation in 1955. Mrs. E. B. Knotts, Sicily Island, Louisiana, presented Mrs. Evans with a bouquet of red roses and a check for $100.00 from the Federated Garden Clubs of the Fifth Louisiana District. The check was immediately endorsed by Mrs. Evans and contributed to the Horticultural Travel Scholarship of the Louisiana Garden Club Federation.

Amaryllis Evansiae and other plant material which was collected by Professor Nelson is being increased through his efforts by use of the greenhouse facilities of Southwestern Louisiana Institute for distribution to the membership of the Louisiana Society for Horticultural Research.

EDITORIAL NOTE.—*Amaryllis evansiae* Traub et Nelson was duly published in Baileya 4: 84-88, figs. 30 & 31. 1956. The reader should also refer to the 1956 Herbertia Edition of Plant Life vol. 12. pp. 30-34, figs. 6, 7 and 8. 1956; and Louisiana Society for Horticultural Research Bulletin No. 1. March, 1956, pp. 13: 15-17, and colored plates; for data on *Amaryllis evansiae* by Prof. Ira S. Nelson.

EDITOR'S MAIL BAG

In May of 1956, Wyndham Hayward was honored by the Orlando (Florida) Garden Club with the Certificate of Merit "in recognition of outstanding horticultural achievements and important contributions to the world of plants."

It is in deepest sorrow that the writer has to report the death of Edward Owen Orpet, of Santa Barbara, Calif., the 1956 Herbert Medalist, on Nov. 12, 1956.

Dr. Moyses Kuhlmann, of the Instituro de Botanica, Sao Paulo, Brasil, contributes an article on the Aztec Lily, *Sprekelia formosissima* in the Spring number of "Flôres do Brasil", 1954. In connection with this he mentions *Sprekelia spectabilis* which is a form of *Amaryllis cybister,* and not a *Sprekelia.*

NEW ORLEANS AMARYLLIS SHOW, 1956

MRS. M. M. SANCHEZ *President*
Garden Circle, New Orleans, La.

The Hon. de Lesseps Morrison, Mayor of New Orleans, proclaimed the period of March 19th to March 25th, inclusive, Amaryllis Week in New Orleans in recognition of the 1956 Official Amaryllis Show of New Orleans which was held March 24th and 25th, 1956.

The Garden Circle sponsored one of the most outstanding shows (exclusively Amaryllis) ever staged in New Orleans on Saturday and Sunday March 24th and 25th, 1956. This was the eighth Official Amaryllis Show of New Orleans and was dedicated to the late Mrs. W. D. Morton, Jr.

The show was beautifully staged using the entire space of the McMain Junior High School cafeteria, 5712 So. Claiborne Avenue. The many Dutch and American Amaryllis made a very colorful appearance and the artistic arrangements were most outstanding.

The show was judged by thirteen acredited flower judges—all accredited judges of The American Amaryllis Society. There were four Gold Cups, Tri Color Ribbons, Sweepstakes, Club Ribbons, and five American Amaryllis Society Awards in horticulture were given.

The quality of all horticulture exhibits, both Dutch and American, were very outstanding. The exhibits are becoming better each year.

The main event of the show was the crowning of the Queen, Miss Joyce Linn Nuss, by the President of The New Orleans Commission Council, Victor H. Schiro. *Maid,* Miss Lynn Lyerer, Miss Carol Schilleci (1955 Amaryllis Queen); *Crown Bearer,* Cindy Lou Mackenroth; *Amaryllis Bearer,* Debbie Jefferson; *Garland Bearers,* Nora Cross, Donna Monier, Jean Robert, Janet McLahlan and Carol Mickal; and *Registrars,* Miss Dianne Digiovannie and Sharon Jacob. Commissioner Schiro presented to the new Queen a gold key to the city.

Fig. 8. The 1956 Amaryllis Queen of New Orleans, Miss Joyce Linn Nuss; crowned by the President of the New Orleans Commission Council, Victor H. Schiro.

Plans are now under way for the 1957 show which promises to be bigger and better as each show has been in the past.

GREATER GULF COAST AMARYLLIS SHOW, 1956

ROBERT E. PARKER, JR., and PERCY S. SKINNER, JR.,
Show Chairmen

The Fourth Annual Greater Gulf Coast Amaryllis Show was held, April 7 & 8, 1956, in the Murphy High School Cafeteria, South Carlin

Street, Mobile, Alabama. The theme of the Show was "Amaryllis Around the World" with the objective of bringing together in friendly competition the hybrid Amaryllis of all strains and other members of the Amaryllis family from all parts of the world.

The show was divided into six divisions—(1) American hybrid amaryllis, (2) artistic arrangements, (3) Dutch hybrid amaryllis, (4) commercial exhibits, (5) hobby exhibits, and (6) art exhibits (oil, water color and pastel paintings of amaryllis and other amaryllids.) Admission was free and the show was well attended.

The theme of the show, "Amaryllis Around the World" was depicted on a little table at the entrance of the exhibition room, it consisted of a globe of the world around which were shown a small train, cars and airplanes which carried potted amaryllis.

The show colors were green and white with all pots covered with green florists' paper and the exhibition tables with white cloths.

The best Dutch hybrid Amaryllis was 'Purple Queen' (Warmenhoven), and the best American hybrid Amaryllis was 'Red Velvet'.

VISITS WITH PLANT ENTHUSIASTS

T. M. Howard, D. V. M., Texas

PART II.

Several seasons ago in Herbertia (1955, pp. 28—30), I contributed the first part of an article concerning my visits with several enthusiasts in the world of Amaryllis. This is the second half of the original article.

After completing my college education, I entered the Army in 1953 as an officer in the Veterinary Corps, with a special training school in Chicago as my first assignment. This gave me an excellent opportunity to visit a few people that were interested in Amaryllids in this area. One of these folks was Glen Moore, a post-graduate student at the University of Chicago. Mr. Moore's hobby was principally *Hymenocallis* and he was doing some remarkable work with this neglected genus. At that time he was writing a thesis on the respiration of the *Hymenocallis* seed. He had previously done similar research on the seeds of Crinums. It seems that the large fleshy seeds of these plants had fascinated him while he was in the Pacific area during World War II. He marveled at the way these big seeds sprouted and formed a complete little bulb while still unplanted, and then shriveled, leaving only the bulb to remain. Later on he was to write his thesis on this little incident of metamorphosis in nature. He became so interested in *Hymenocallis* that he managed to acquire a most impressive botanical collection of many different species, most of which were undescribed. The thing that made his interest seemingly important was the fact that he was crossing the various species in order to secure new hybrids. One of the rooms in the greenhouse at the University was filled with pots of hybrid seedlings as well as potted plants of the various species. Unfortunately, Mr. Moore's work was temporarily halted when he graduated and had to return to his home in Utah with his plants. The move forced him to dry off his seedlings and very likely set them back for a season. I have lost all contact with Mr. Moore since that time, but I sincerely hope that he has kept up with his hobby and that he has by now realized the flowering of his hybrids.

One weekend while in Chicago, I motored down to Cincinnati, Ohio for a visit with another enthusiast with whom I had become acquainted by correspondence—Len Woelfle. Like Glen Moore, he also was principally interested in *Hymenocallis* and others of that group. He too has done considerable work in trying to hybridize members of this genus, but he has focused most of his attention on members of the ''Ismene'' group, whereas Moore was working principally with the evergreen, robust ''spider lily'' types. Like Glen Moore, Mr. Woelfle's interest in *Hymenocallis* is uncommon, since this genus is little appreciated by the average gardener and grossly neglected by most botanists. We could use more folks like these two men to unravel some of our botanical-horticultural problems. I certainly did enjoy the warm hospitality of the Woelfles during my brief visit and hope that perhaps our paths may cross again in the not too distant future.

During this late summer of 1953 I contacted Raymond B. Freeman, of Western Springs, a suburb of greater Chicago. Mr. Freeman was interested in Alliums, and quite naturally he had a very nice collection in his garden. I am afraid that I took him by surprise when I introduced myself, as he had expected to meet a much older man, perhaps of middle age or better. Never-the-less we had an enjoyable visit discussing Alliums and the differences between gardening in Illinois and gardening in South Texas. The Freeman garden would be considered typical of American suburban life, save that the Alliums that grew there made this garden most out-of-the-ordinary.

I did not stay very many weeks in Chicago, before I completed the special school and was sent to Ft. Benning, Ga. This was a stroke of luck, as it gave me opportunities to visit with other Amaryllid enthusiasts in Florida and Alabama. While attending a New Year's bowl game in Jacksonville, Fla., I managed to drive down to Orlando and visit two of the more prominent figures in horticulture in the persons of Wyndham Hayward and Mulford B. Foster. Both they and their gardens were outstanding. Both shared that enthusiasm that makes friends of total strangers in the world of horticulture. Mr. Hayward's garden is hidden from the road by dense citrus trees and shrubbery that surrounded the Lakemont Gardens. Within this grove were his home and greenhouses as well as his many bulb beds. I fear that the morning of January 1 is not the time to come a-calling, even in our informal South, but Mr. Hayward was most gracious and proceeded to show me the grounds with its many exotic treasures that grew so lushly in the fine central Florida climate. Due to previous correspondence, I was no stranger to Mr. Hayward and conversation came very easily. We covered a lot of subjects that morning. He informed me that he was constantly waging a never-ending battle with weeds, and that he was not always the victor. Like many others in the plant business where large grounds are kept, his place occasionally suffered for lack of reliable labor at reasonable wages. After a most enjoyable visit, Mr. Hayward directed me to Mulford Foster's gardens.

I was unprepared for Mr. Foster and his gardens. I was about as overwhelmed as a backwoods Hillbilly visiting a big city for the first time. Meeting Mr. Foster is an off-beat experience in the field of horticulture. True, every dyed-in-the-wool enthusiast has a ''message'' of a sort to stimulate another of similar interests, but Foster was in every way real and his greenhouses awesomely different. His Bromeliads were magnificent and his Amaryllids seemed all the more exciting as he described how and where he collected each one. Time went all too fast, and I had to say goodby to this energetic gentleman. His boundless enthusiasm, and insatiable curiosity in seeking the as-yet-undiscovered has led him into many foreign countries in his quest for new species. Considering his discoveries and his resulting hybrids, it would be an understatement in the use of lavish adjectives to praise his contributions to horticulture.

Later, in early spring, I was to receive an invitation from Mrs. Grace Primo to attend the annual Amaryllis Show in Mobile, Alabama. Mrs. Primo is a real down-to-earth gardener like most of us, but she too possesses that extra bit of enthusiasm that makes her prominently authoritative in her field. She has done more than her share in order to popularize amaryllids in the lower south, particularly Crinums. In the past, her list of various *Crinum* species and hybrids was nearly as lengthy as any to be found in this country. I enjoyed my visit immensely and regret that I have not been able to again return to Mobile during the Azalea and Camelia season.

While in the service, one is constantly being moved about, so it was no surprise to find myself back in Texas to finish my military obligation to Uncle Sam. While stationed at Ft. Hood, Texas, I was able to resume more collecting trips into Mexico, and re-visit my old friends, Fred Jones and Morris and Kitty Clint. Paradoxically, I, in turn, was honored by a visit from another prominent plantsman, Wm. Lanier Hunt. Mr. Hunt and I had a very nice chat about gardening and he showed me some of his fine color slides taken in Europe and in his North Carolina gardens. So you see, when people are interested in unusual hobbies, distance ceases to be a problem and mutual interests can be as binding as the kinship of blood relations.

AMARYLLIS ROUND ROBIN NOTES, 1956

MRS. FRED FLICK, *Chairman,*
Amaryllis Round Robins, Carthage, Indiana

[The following notes were extracted from Round Robin letters by Mrs. Fred Flick, who is Chairman of the Amaryllis Round Robins.—*Editor.*]

Len Woelfle.—''Since so many of you have troubles with *Hymenocallis* of the Ismene group not blooming for you let me make this a letter about them. I will tell you what I do with them to get bloom. I now have about fifteen or twenty species of *Hymenocallis* from all over the states and Mexico, plus species from S. America.

I generally get bloom from all, but do have a little trouble with 'Advance' and *macleana.* I have never been able to determine why they do not bloom consistently. I believe I have been planting *Macleana* too deep so that it gets too much moisture soon after planting. My soil is rather heavy clayey loam. I never use fertilizer.

I usually plant them in the garden in May when the soil is fit to work, in beds 3 ft. wide, raised a little above the soil, and about 4″ deep, so that the bulb is about flush with the surrounding soil. This is not necessarily for drainage, but more so I don't have to dig so much each spring. I leave three foot spaces between the rows.

So starting about May 15th, I plant the bulbs. We usually have good rains in May and June, and about the middle of June they start to bloom. Some are in bloom at almost all times during the summer up until September, depending on the variety. I usually dig all my bulbs by the middle of October. I cut off the tops and most of the roots; put them in paper bags until the next spring. Store them over winter in the basement at temperatures from 50 to 70 degrees F. That is for 'Advance', 'Festalis', 'Sulphur Queen', *amancaes, narcissiflora, macleana, harrisiana,* a couple of Mexican species, the ones from our South which have a rather heavy green leaf, 2—3 inches broad and a long neck, known as *tenuiflora, rotata, littoralis, caribaea,* etc., and *Elisena longipetala.*

No one seems sure about the species, of most of our N. American *Hymenocallis.* The narrow green leaved variety from Louisiana and east Texas known as *liriosme* and *galvestonensis* are hardy at Cincinnati, Ohio to zero or below without protection. The one from east Texas that has erect, glaucous foliage and blooms from naked scapes in late summer after the foliage dies down, known as *occidentalis. H. Eulae* is also hardy here. The Indiana species from southwestern Indiana, having glaucous, erect foliage and a large beautiful flower is hardy too, and blooms in July. These seem to do well only if left out of doors in the soil over winter.'' From Ohio.

Edith Strout.—''*Amaryllis* x *johnsonii* type from Costa Rica bloomed for the first time this year. This bulb came originally from Mr. Hannibal. It did not seem as funnel shaped as the *johnsonii* from Ascension Island. It was definitely fragrant, and was a cardinal red.''

''*Haemanthus multiflorus* will open its flower spike in a matter of three or four days from the time the bud first appears until it is in full bloom; and it only lasts a short time, four or five days.

Haemanthus andromeda is very slow to develop. It took over a month for its bud to develop and open, and it lasted for two weeks.

Haemanthus katherinae has never bloomed for me.'' From Calif.

Polly Anderson.—The most colorful plant in my garden this late July is a plot of evergreen *Watsonia* from seed from South Africa. They are smaller flowered, but more prolific than the regular deciduous kinds, last longer and of course have evergreen foliage, bloom in midsummer instead of April. They are limited to one color range; from light apricot through pink and orange rose and light red, with no whites or lavenders.'' From Calif.

AMARYLLIS JUDGE'S CERTIFICATES

Since the last report in HERBERTIA 1955 (pages 31-32), the following Amaryllis Judge's Certificates have been issued by the AMERICAN AMARYLLIS SOCIETY:

18. Mrs. B. E. Seale, 4036 Prescott, Dallas, Texas
19. Mrs. Robert Ewing, 7122 Lakewood Blvd., Dallas 14, Texas
20. Mrs. Hugh A. Purnell, 2926 Maple Springs, Dallas 19, Texas
21. Mrs. Margaret Scruggs Carruth, 3715 Turtle Creek Blvd., Dallas, Texas
22. Mrs. A. C. Pickard, 1702 North Blvd., Houston 6, Texas
23. Mrs. Sam Forbert, 117 North 23rd Ave., Hattiesburg, Miss.
24. Mrs. R. A. Fowler, P. O. Box 670, Hattiesburg, Miss.
25. Mrs. G. B. Reneau, 2625 Persa St., Houston, Texas
26. Mrs. Luther N. Davis, 2206 Hardy St., Hattiesburg, Miss.
27. Mrs. Melvin Thomas, 220 29th Ave., Hattiesburg, Miss.
28. Mrs. Mary Lucas, 609 South 21st Ave., Hattiesburg, Miss.
29. Mrs. B. P. Russum, 406 6th Ave., Hattiesburg, Miss.
30. Mrs. J. W. Snowden, P. O. Box 226, Hattiesburg, Miss.
31. Mrs. F. T. Newton, P. O. Box 1185, Hattiesburg, Miss.

Examinations for the Amaryllis Judge's Certificate. For information about taking the examination for the Amaryllis Judge's Certificate of the AMERICAN AMARYLLIS SOCIETY, please write to Mr. W. D. Morton, Jr., 3114 State Street Drive, New Orleans 25, La. Judges are requested to attend a local refresher short course each year, if possible, in order to keep up with progress in this field.

NEW LOCAL AMARYLLIS SOCIETIES

During the year 1956 the Hattiesburg Amaryllis Society was organized through the leadership of Mrs. R. A. Fowler and Mrs. Sam Forbert. A more detailed report will appear in the next HERBERTIA.

As we go to press, word has been received that the Corpus Christi Amaryllis Society was organized under the leadership of Mrs. H. L. Harris; that the Houston Amaryllis Club is being organized under the leadership of Mrs. A. C. Pickard. Other local Amaryllis societies are in the organization stage. Fuller reports will appear in 1958 Herbertia.

NATIONAL AMARYLLIS JUDGES COUNCIL

All accredited Amaryllis judges are members of this organization which was proposed by Mrs. B. E. Seale of Dallas, Texas and founded in 1957. Fuller report will appear in 1958 Herbertia.

2. SPECIOLOGY

[EVOLUTION, DESCRIPTION, CLASSIFICATION AND PHYLOGENY]

CYTOLOGICAL INVESTIGATIONS IN LYCORIS
1. THE SOMATIC CHROMOSOMES OF **LYCORIS CALDWELLII, L. HAYWARDII** AND **L. HOUDYSHELII**

S. Bose

INTRODUCTION

Cytological studies in seven species of *Lycoris* Herb. have been carried out by Inariyama (1931; 1932; 1937 and 1953). His finding of 2n=12 in *L. aurea* (L'Hérit.) Herb. was the lowest somatic chromosome number encountered, while his highest was in *L. radiata* (L'Hérit.) Herb. with a 2n of 33. In addition to this he reported the existence of 2n=13 and 14 chromosome types in *L. aurea* and of 2n=22 in a variety of *L. radiata.* Other species for which chromosome numbers, and descriptions have been supplied by the same author are, *L. straminea* Lindl. 2n=16; *L. albiflora* Koidz. 2n=17; *L. sprengeri* Comes ex Baker 2n=22; *L. sanguinea* Maxim. 2n=22 and *L. squamigera* Maxim. 2n=27.

Other workers such as Sato (1938) and Mookerjea (1955) have also studied the karyotype in some species of *Lycoris.*

The present author is making a detailed survey of chromosome numbers and types, and of cytological variations occurring, in the several species of Lycoris. The report presented here is based on a study of the somatic chromosomes of three new species of the genus. Particular attention has been devoted to an analysis of their karyotypes and to consideration of their cytological and phylogenetical relationships with other species of *Lycoris.*

The morphological description and systematic position of these three new species are discussed by Dr. Traub and Mr. Caldwell elsewhere in this same issue of HERBERTIA.

MATERIALS AND METHODS

The following new species of *Lycoris,* described in this issue of HERBERTIA (Traub, 1957) were included in the present investigations:—(1) *L. caldwellii* Traub; (2) *L. haywardii* Traub; and (3) *L. houdyshelii* Traub.

Bulbs for this study were generously furnished by Mr. Wyndham Hayward of Lakemont Gardens, Winter Park, Florida.

Roottips were placed in a saturated solution of paradichlorobenzene (Meyer 1945) 2-4 hours prior to fixation. This pretreatment in P. D. B. not only helped in scattering the chromosomes but also resulted in details of their morphology being more readily observed. Fixation was in acetic:alcohol, 1:3, for 24 hours. Following fixation, roottips were hydrolysed in 10% HCl for 10 minutes before placing in 2% aceto-orcein. The staining solution containing the roottips was then heated over an alcohol lamp for a few seconds. Roottips were left in the aceto-orcein for from 15 minutes to 4 hours. Deeply stained portions of the roottips were smeared and considerable pressure was applied to get maximum flattening and spreading of the chromosomes. The slides were then gently heated again over the flame to intensify the stain. It was found that a pretreatment for 3 hours in P. D. B. gave best results with materials of all the three species.

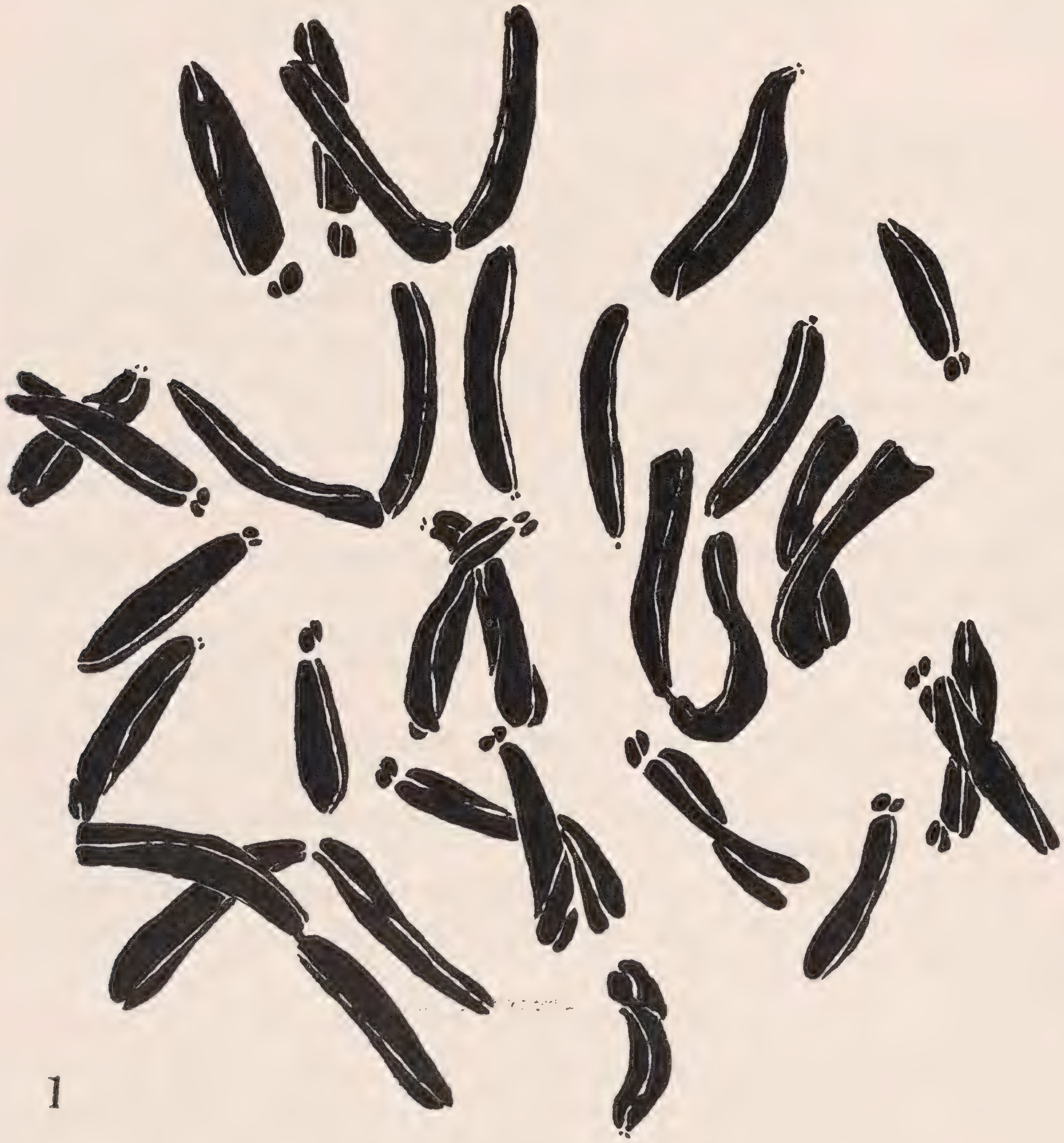


Fig. 9. (= 1). *Lycoris caldwellii* Traub. 2n=27. Somatic metaphase chromosomes; polar view. x2500.

In each of the three species included in the present study a detailed analysis of the karyotypes was made and idiograms were drawn for each of them. Only very flat plates with well spread and unbroken chromosomes permitting careful observation of details were examined.

Conclusions regarding the morphology of the chromosomes were drawn from the observations of four excellent plates in each case. Special attention was devoted to the finding of satellited chromosomes the importance of which in the karyotype analysis in *Amaryllidaceae* has been stressed by Sato (1938).

Drawings were made with a camera lucida using a 1.25 N. A. apochromatic objective (x90) with compensating eyepiece (x15) giving a magnification at table level of x2500 approximately.

OBSERVATIONS

On the basis of the present study the chromosome complements can be classified into the following types:—Type A—Chromosomes with median primary constrictions. (18.4 μ). Type B—Chromosomes with subterminal primary constrictions. (8.6 μ). Type C—Chromosomes with subterminal primary constrictions and a satellite on the shorter arm. (10 μ). Type D—Chromosomes with nearly terminal primary constrictions and a dot like shorter arm. (9.2 μ).

According to size differences existing among the individual chromosomes of types B and D they are further subdivided into the shorter Types; B1 (7.2 μ) and Type D1 (8 μ).

Idiograms for each type are depicted in Figure 4.

Karyotypes of three species:

L. caldwellii Traub. 2n=27. 6 chromosomes of type A; 11 chromosomes of Type B; 2 chromosomes of type B1; 6 chromosomes of type D and 2 chromosomes of type D1. (See Figs. 1 and 4). Total length of chromosomes complement, 280.6 μ

L. haywardii Traub. 2n=22. 16 chromosomes of type B; 2 chromosomes of type B1 and 4 chromosomes of type C. (See Figs. 2 and 4.) Total length of chromosome complement, 192.0 μ

L. houdyshelii Traub. 2n=30. 3 chromosomes of type A; 15 chromosomes of type B; 2 chromosomes of type B1; 4 chromosomes of type C; 4 chromosomes of type D and 2 chromosomes of type D1. (See Figs. 3 and 4.) Total length of chromosomes complement, 291.4 μ

Table I summarizes, for each of the three species concerned with here; (1) the number of chromosomes of each type, and (2) the total 2n number observed. Table II presents data on the measured lengths of each type of chromosome and for whole complements, of each species.

In addition to the usual number of 22 encountered in *L. haywardii* cells with 11 and with 23 somatic chromosomes were noticed.

DISCUSSION

Types of chromosomes found in the three new species of *Lycoris* dealt with here, are quite similar to those in the somatic complements of previously studied species of the genus. The A type described here corresponds with the V shaped or medianly constricted chromosomes of Inariyama. The rod-shaped chromosomes dealt with by the same author corresponds with the rest of the types differentiated here (as B; B1; C; D; D1). Type C with satellites on the shorter arm were noticed in two out of three of the species. *(L. haywardii* and *L. houdyshelii)*. Chromosomes of this type have been identified by Sato (1938) in *L. squamigera*, and by Mookerjea (1955) in *L. radiata*. It seems likely that improved technique may reveal more of the C type to be present. Several other chemicals are being tried as pretreatments with this possibility in mind.

Inariyama (1931; 1937) considered *L. squamigera* with 6V and 21 rod-shaped chromosomes to be a triploid and a natural hybrid between two species of *Lycoris*. Nothing definite can now be suggested regarding the original of *L. caldwellii* with its 6V and 21 rod-shaped chromosomes. It would seem, as if its origin would prove to be somewhat similar to that of *L. squamigera*.

The finding of a haploid chromosome number in one root tip cell of *L. haywardii* can be attributed to somatic reduction (Huskins and Cheng; 1950). Cells with 23 chromosomes may possibly originate through non-disjunction. Spindle abnormalities, as noted by Snoad (1955) in *Hymenocallis*, can also give rise to cells with 11 and 23 chromosomes.

Table I

Chromosome numbers in *Lycoris* species: (1) of each different type, and (2) of the somatic complements.

Number of chromosomes of	*L. caldwellii*	*L. haywardii*	*L. houdyshelii*
Type A	6		3
Type B	11	16	15
Type B1	2	2	2
Type C		4	4
Type D	6		4
Type D1	2		2
2n complement	27	22	30

Table II

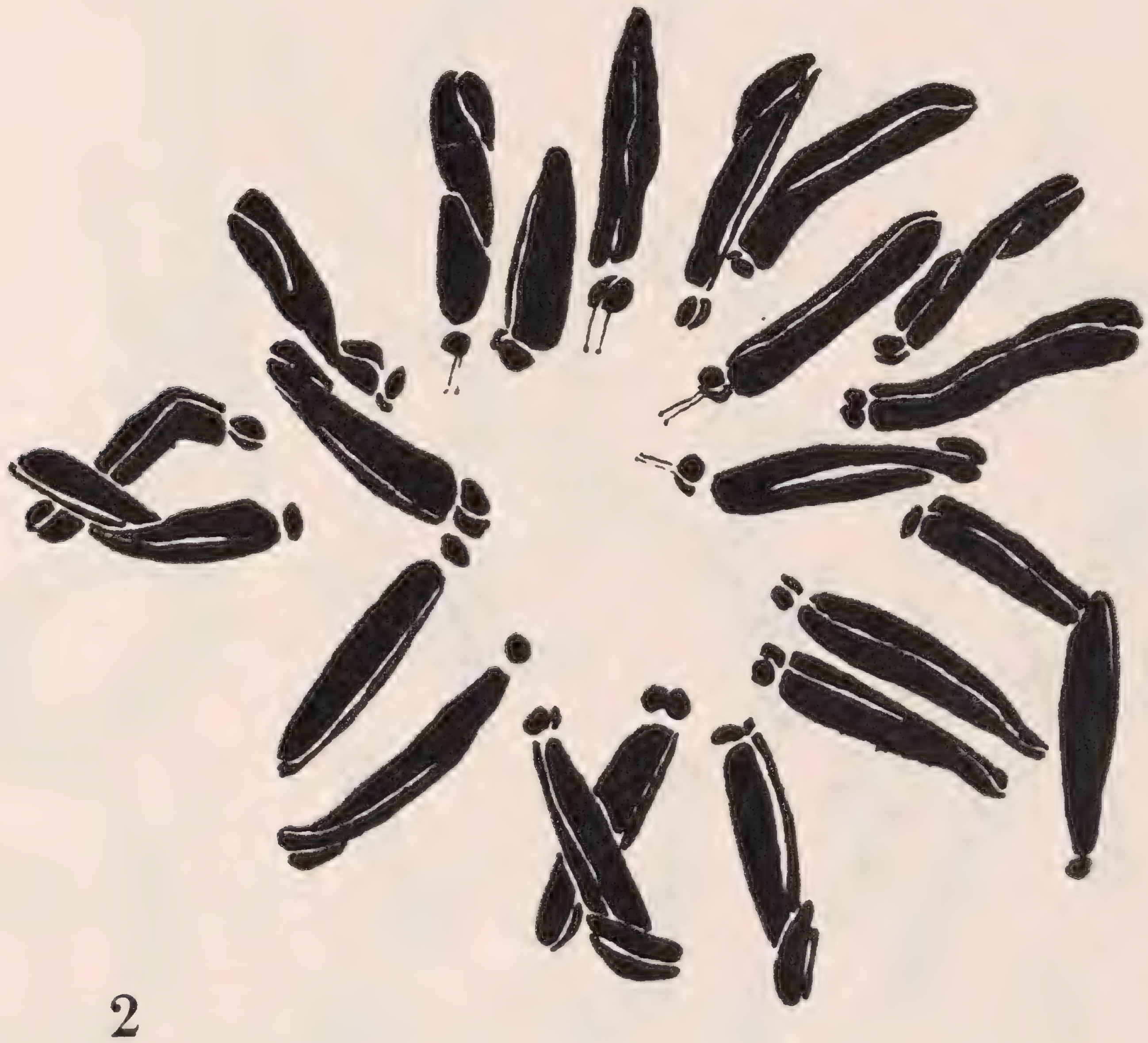
Average length in microns (μ) of *Lycoris* chromosomes at mitotic metaphase, following pretreatment with P. D. B.

Average chromosome lengths of	*L. caldwellii*	*L. haywardii*	*L. houdyshelii*
Type A	18.4		18.4
Type B	8.6	8.6	8.6
Type B1	7.2	7.2	7.2
Type C*		10	10
Type D	9.2		9.2
Type D1	8		8
Total complement	280.6	192.0	291.4

---

* *Including satellite*

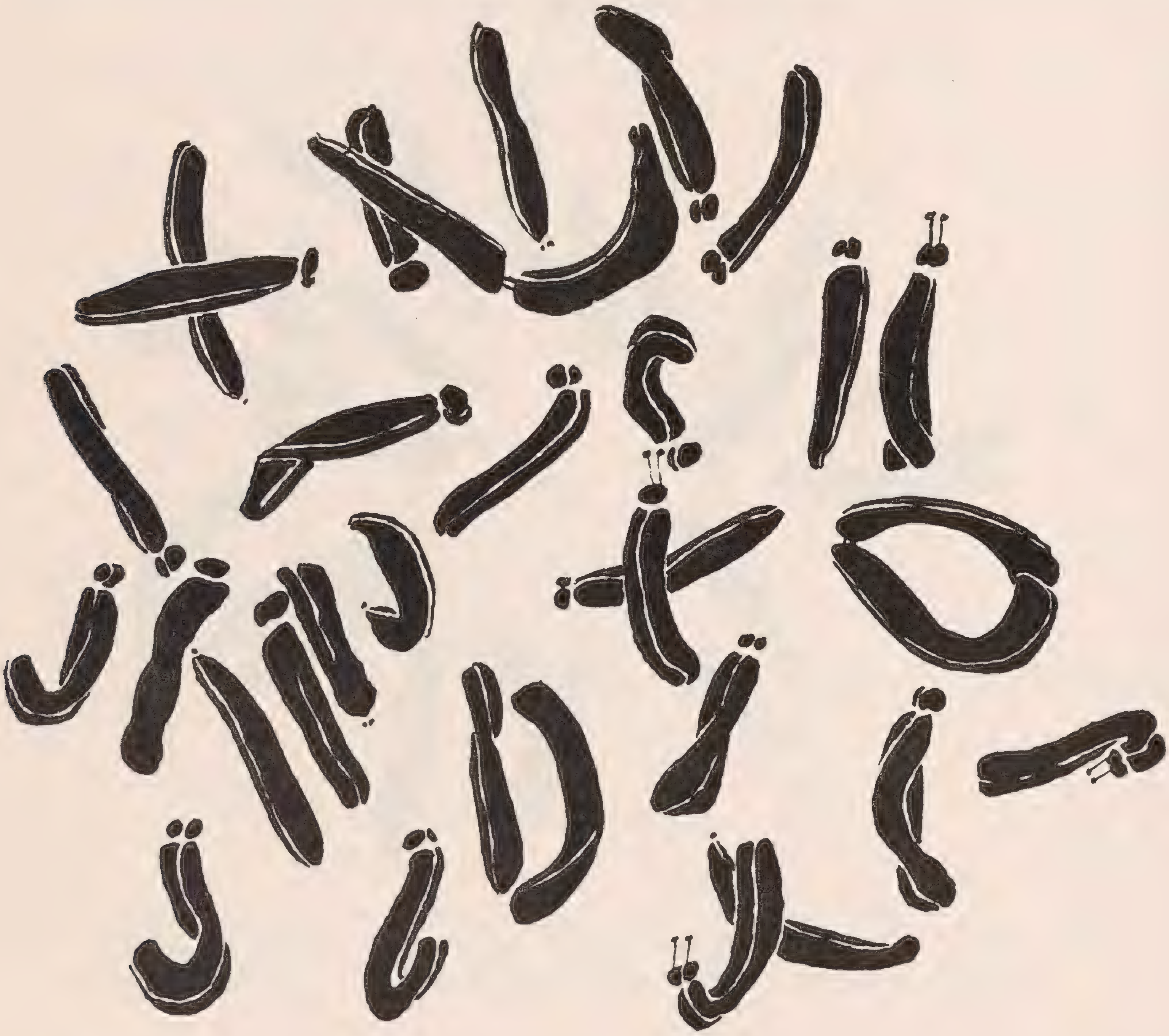
The most interesting thing observed here was the presence of a large number of chromosomes with nearly terminal centromeres. Until studied carefully these often appear to be telocentric, but detailed examination usually reveals a small amount of chromatin beyond the centromere. Such chromosomes have been found in other genera of the *Amaryllidaceae*, as for example in *Allium* and *Nothoscordum* by Levan (1935) and in *Nothoscordum* by Levan and Emsweller (1938). The latter authors have termed the same type of chromosomes as t chromosomes or terminally attached chromosomes. Recently Flory (1950) and Schmidhauser (1954) observed similar chromosomes in *Hymenocallis.* Levan and Emsweller and also Schmidhauser assumed that these chromosomes with apparently terminal centromeres were found by transverse fragmentation of the centromere of a medianly constricted chromosome. The former workers strengthened their assumption by observing the Metaphase I pairing of a medianly constricted or m chromosome with two t or telocentric chromosomes in *Nothoscordum fragrans.* Furthermore the total length of each m chromosome was found to be approximately equal to that of two t chromosomes. The same condition was observed by Schmidhauser in the somatic chromosomes of *Hymenocallis.* In the present study also the D type of chromosomes with nearly terminal centromere were approximately half the length of a chromosome with a median constriction. In other species of *Lycoris* the pairing of two rod-shaped chromosomes with one V-shaped chromosome has been noticed by Inariyama (1932). He tends to believe however that in *Lycoris* every V shaped chromosome is formed by the fusion of two rod-shaped chromosomes. Meiosis has not been studied in the three present species hence data bearing on this point cannot be advanced from this study.



2

Fig. 10 (= 2). *Lycoris haywardii* Traub. 2n=22. Somatic metaphase chromosomes; polar view. x2500.

Inariyama (1937; 1953) suggested the basic number in *Lycoris* to be 11 rather than 6. He assumed that a species with 22 rod-shaped chromosomes gave rise to all other types by the fusion of some rod-shaped chromosomes. The role of hybridization and polyploidy was also considered by him in this connection. His alternative theory, which he does not favor, proposes that a species like *L. aurea* with the maximum observed number of V-shaped chromosomes gave rise to all other types in *Lycoris* by fragmentation of V's. On the first theory we have to assume that the fusion of two rod-shaped chromosomes would give rise to a chromosome with two centromeres. In the second theory, a fragmentation across the centromere would presumably leave the new chromosomes without a centromere, in effect at least.



3

Fig. 11 (= 3). *Lycoris houdyshellii* Traub. 2n=30. Somatic metaphase chromosomes; polar view. x2500.

The decrease or increase of chromosomes or of basic numbers in a plant by simple end to end fusion of single chromosomes, or by fragmentation of a chromosome, have been questioned by Darlington (1937; pp 69-71 and 559-560) and later by Stebbins (1950; pp 445-447). They assume that neither a chromosome without a centromere nor a chromosome with two centromeres can function normally. Moreover these phenemena are not observed in the chromosome complements of naturally occuring populations. According to Darlington's scheme modified by Stebbins (l.c.) the loss or gain of a centromere or the loss or gain of a chromosome is believed to originate through unequal translocations; furthermore the activeness or inertness of the centromere is thought to play a part in the increase or decrease of the basic number.

The theory propounded by Darlington (1939a; 1940a), when studying *Fritillaria,* concerning the mechanism of the formation of telocentric chromosomes by misdivision of the centromere and the origin of isochromosomes by sister-strand reunion of broken ends, should be considered in connection with chromosome evolution in *Lycoris.*

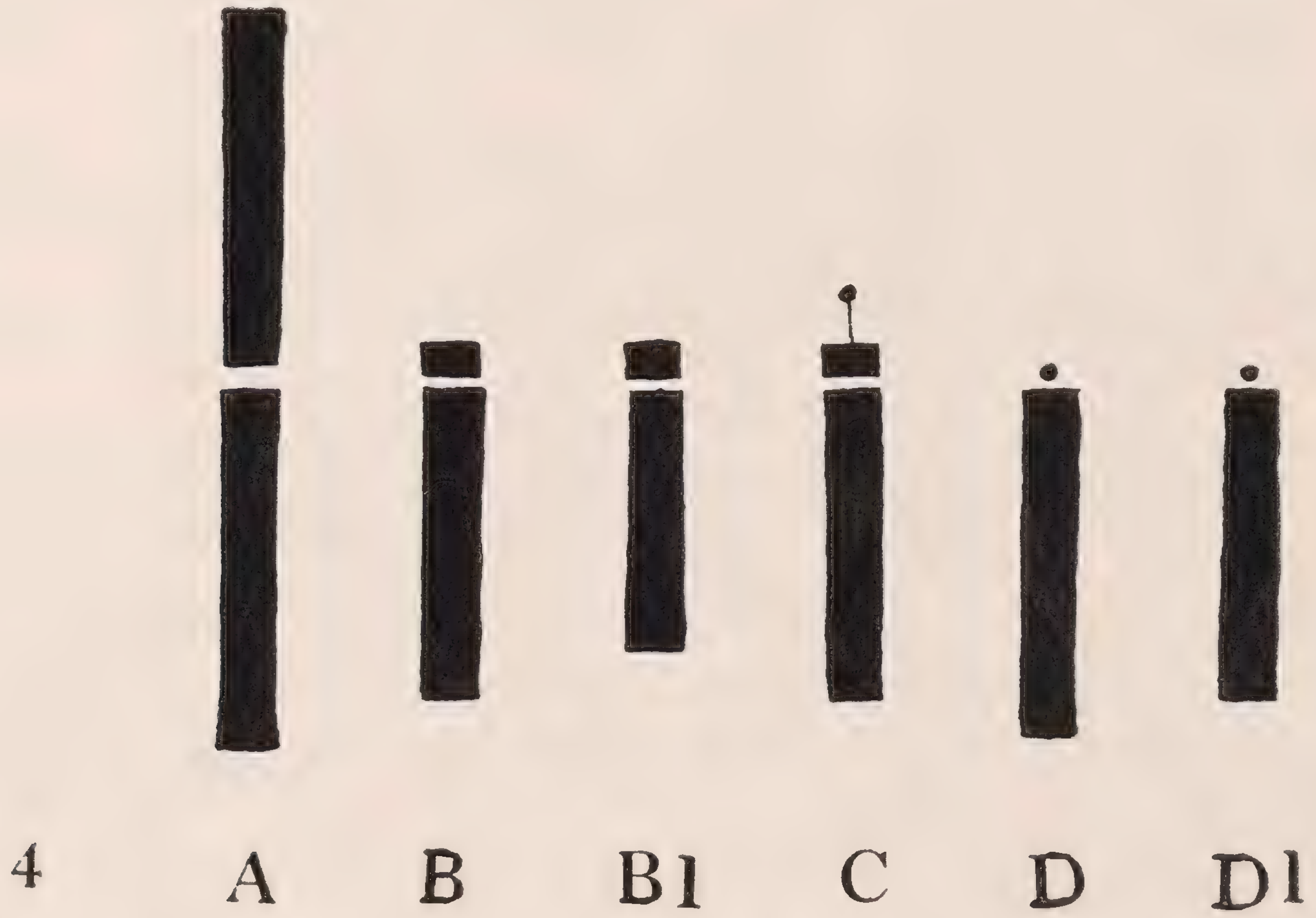


Fig. 12 (= 4). Idiogram of each of the chromosome types; A, B, B1, C, D, and D1.

Careful meiotic, and mitotic, studies of most *Lycoris* species must be available before there is a really valid basis for suggestions regarding the evolution of chromosomes, and of basic chromosome numbers, here.

SUMMARY

Chromosome numbers in three new species of *Lycoris,* have been determined. Somatic chromosome numbers are:—*L. caldwellii,* 2n=27; *L. haywardii,* 2n=22; and *L. houdyshelii,* 2n=30. A detailed karyotype analysis has been carried out, and descriptions given. In *L. haywardii* cells with 11 and 23 chromosomes were observed also.

The origin of chromosomes with nearly terminal centromeres is discussed. The problem connected with the evolution of chromosomes, and of basic numbers in *Lycoris,* is discussed, in the light of various theories.

ACKNOWLEDGEMENTS

The author wishes to acknowledge his indebtedeness to Dr. W. S.

Flory, Jr., for his guidance and criticism during the course of this investigation. *The Blandy Experimental Farm, University of Virginia.*

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LYCORIS TRAUBII SP. NOV.

Wyndham Hayward, *Florida*

Several years ago Japanese bulb dealers began exporting to America stock of a saffron-yellow flowering *Lycoris* Herb, species, possibly originating in Formosa. The writer at first believed that it was a variety of *Lycoris aurea* (L'Hérit.) Herb., and he reported his conclusions on page 160, with illustrations, in the March 1955 issue of HORTICULTURE (Boston, Mass.), where he pointed out that the new plant was definitely superior in a number of characteristics to the well-known *Lycoris aurea.* After further study it became clear that the new plant was distinct from *L. aurea,* and the new species has been named for Dr. Hamilton P. Traub, of La Jolla, California, who has worked for a long time to straighten out the taxonomy and nomenclature of the genus *Lycoris.*

The more important differences between *Lycoris traubii* Hayward and *L. aurea* (L'Herit.) Herb. are listed in Table 1.

TABLE 1. The more important differences between *Lycoris traubii* and *L. aurea.*

Character	*L. traubii*	*L. aurea*
Leaves	Appearing in the fall about a month later than in *L. aurea; glabrous,* lorate-lanceolate	Appearing early in the fall; *glaucous,* almost elliptic
Spathe-valves	relatively short (4 cm.); ovate	relatively longer (8 cm.); lancelote
Pedicels	up to 9 mm. long	15—22 mm. long
Flower habit	more or less horizontal	somewhat upright
Flower color	saffron-yellow	Cadmium-yellow
Tepaltube	19 mm. long; curved downward	12 mm. long; straight
Tepalsegs	narrowly-oblanceolate; 12-15 mm. wide	narrowly-elliptic; 10—11 mm. wide
Hardiness to cold	relatively cold resistant; known to be grown in Maryland; wider range not investigated	relatively tender; in U. S. thrives outdoors only in lower South; south Texas and southern Calif.

Lycoris traubii Hayward, **sp. nov.**

Umbella 6-flora, floribus croceis, tubo tepalorum 1.9 cm. longo decurvato, paraperigonio labriformi brevissimo minute 6-lentato, genitalibus a perigonio multo exsertis.

DESCRIPTION.—*Bulb* globose. *Leaves* 7—11 per bulb, appearing in the fall about a month later than those of *Lycoris aurea,* and persisting until spring; up to 22.5 cm. long, 2.1 cm. wide at the middle, tapering gradually to a roundish apex, and to 1.6 cm. wide at the base; glabrous Spinach Green (Wilson, 0960) on the upper side, with a narrow lighter stripe in the center, lighter dull green, non-glabrous, on the under side; fairly upright. Scape produced in September, solid, almost round, entirely light green, 32.5 cm. tall, 1.1 x 1.2 cm. in diam. at the base, 6.5 x 7 mm. in diam. at the apex. *Spathe-valves* 2, ovate, apex blunt or pointed, 4 cm. long, about 1.5 cm. wide at the base; bracteoles smaller, up to 2 cm. long, but usually smaller. *Umbel* 6-flowered. *Pedicels* very short to 9 mm. long. *Flowers* with saffron yellow (Wilson, 7/1) band in center of the tepalsegs, rest of tepalsegs, and rest of flower, including the tepaltube, stamens and style, lighter saffron yellow (Wilson, 7/2); flowers held horizontal or slightly declined. *Ovary* 11 mm. long, 7.5 mm. in diam., 3-sided, with rounded edges; ovules about 6 per locule. *Tepaltube* curved downwards, 1.9 cm. long, 4 mm. in diam. at the base, 9 mm. in diam. at the apex, 3-sided, with rounded edges. *Paraperigone* yellow, consisting of a very short rim with 6 minute teeth. *Tepalsegs* 6.8—7 cm. long, 1.2—1.5 cm. wide at or slightly above the middle, apex acutish, narrowing to 7 mm. wide at the base, narrowly-oblanceolate, margins somewhat undulate, apex reflexed. *Stamens* and *style* much exserted from the perigone; style longer than the stamens; *stigma* minute, red.

SPECIMEN: No. 558a + 558b (holotype, TRA), 9-22-56, cult. La Jolla, Calif., Hamilton P. Traub.

NOTE.—*Lycoris traubii* is imported yearly by the thousands from Japan, and the bulbs are sold extensively by bulb dealers. *L. traubii* is grown outdoors under the name *L. aurea* at the U. S. Plant Introduction Garden, Glendale, Maryland (See Creech, Nat'l Hort. Mag., Apr. 1952. pp. 167-173.). Reports in HERBERTIA are needed about its performance and culture in other parts of the country, particularly the North Central States and Canada. The reader should also turn to the brief article on *Lycoris traubii* by Mr. Wood, of Macon, Georgia, and the second report by Drs. Traub & Moldenke on *Lycoris* x *woodii,* both in the present issue of HERBERTIA. Mr. Wood imported *L. traubii* (under the name, *L. aurea)* from Japan before the last war, and has grown it for many years, and used it in hybridizing.

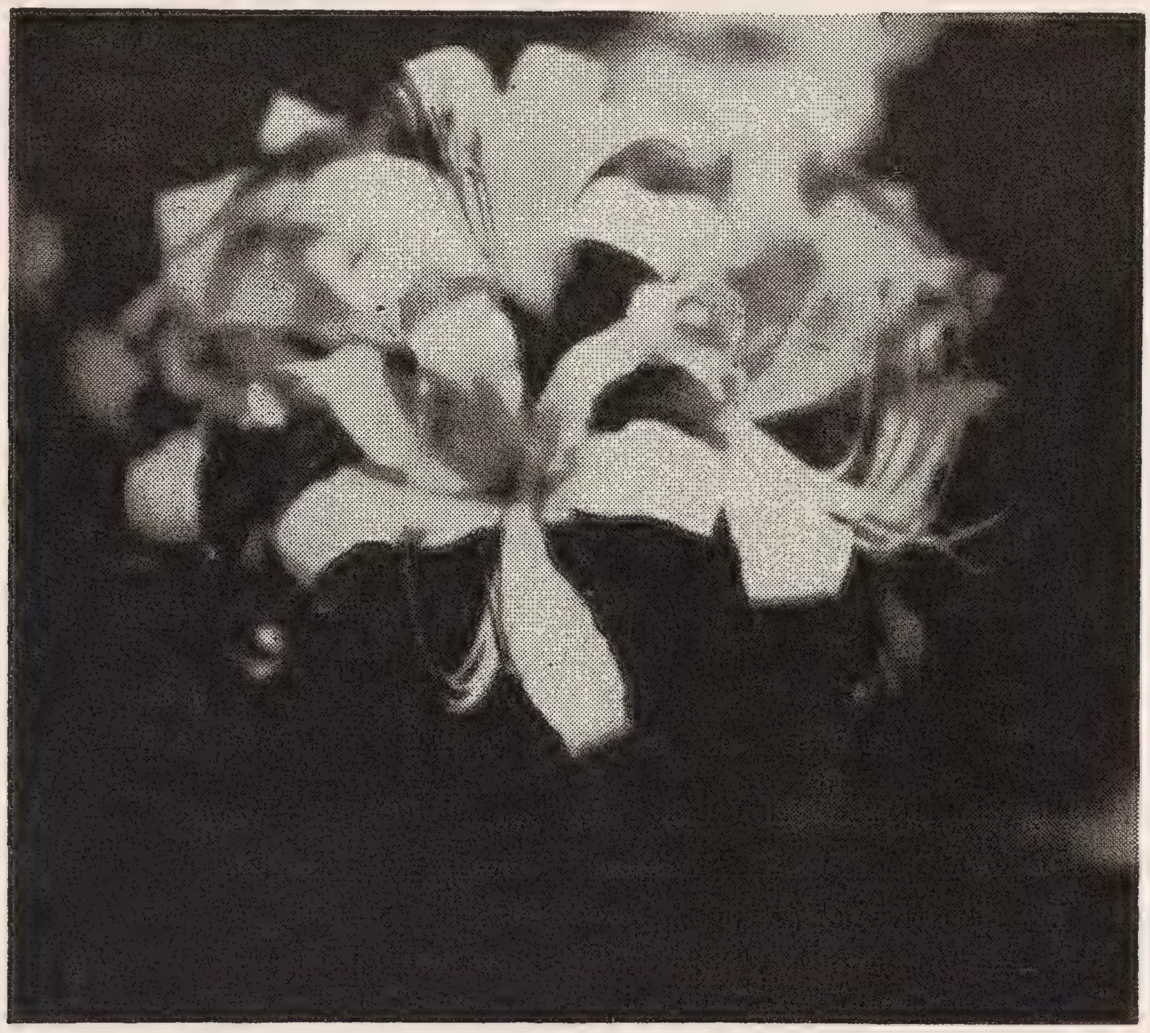


Fig. 13. *Lycoris traubii* Hayward *sp. nov.* Photo by Wm. T. Wood.

LYCORIS HAYWARDII, L. HOUDYSHELII AND L. CALDWELLII

HAMILTON P. TRAUB, *California*

For a number of years several undescribed *Lycoris* species have been grown in the United States; some under various unrecognized names. Mr. Wyndham Hayward imported *Lycoris* bulbs from China in the 1940's up to 1948 when the communists took over. After 1945, many *Lycoris* bulbs under various names have been imported from Japan by Mr. Hayward and others. Most of these, including some undescribed species, have yellowish or creamy-yellow flowers, sometimes streaked with pinkish, particularly with aging.

So long as the *nomen subnudum, Lycoris straminea* Lindl., was not connected with its type specimen, it did not appear proper to name the species with creamy-colored flowers because later one of these might turn out to be that species. The type of *Lycoris straminea* Lindl., was at last located as reported in 1956 HERBERTIA. Thus it is now possible to describe the new species.

As an introduction to the new species, these have been included in the following revised key along with those previously known. The new species are *L. haywardii*, *L. houdyshelii* and *L. caldwellii* described in the present paper, and also *L. traubii* [Fig. 13] which Mr. Hayward has most graciously named for the writer in another paper appearing in this issue of HERBERTIA (Hayward, 1957).

TABLE 1. KEY TO THE SPECIES OF **LYCORIS**

1a. Perigone fairly regular; leaves without a stripe or band in center (see also *L. caldwelli* with similar leaves):

Subgenus 1. **SYMMANTHUS**

2a. Flowers bluish-mauve, rose-lilac, orchid pink and blue or purple-carmine and prussian blue:

2a. Tepaltube very short (barely defined according to Worsley):
Stamens and style not exserted from perigone (Upper Burma) ....1. *argentea*

3b. Tepaltube 11 mm. long to over 25 mm. long:

4a. Leaves 2—2.5 cm. wide; tepaltube over 25 mm. long:
Perigone 8.9—10 cm. long; flowers rose lilac (Japan) ....2. *squamigera*

4b. Leaves less than 2 cm. wide; tepaltube 11—13 mm. long:

5a. Flowers produced in July-August; tepalsegs 4.2 cm. long; flowers in the reddish-violet range, orchid purple, hyacinth blue at the tips (Japan) Fig. 16 ....3. *haywardii*

5b. Flowers produced in Sept.-October; tepalsegs 6.1 cm. long; vivid rose in throat, otherwise purple and carmine, prussian blue in upper part (Central China) Fig. 15 ....4. *sprengeri*

2b. Flowers without any lilac or blue:

6a. Tepaltube 4—5 mm. long:
Flowers brick-red; stamens slightly exserted from the perigone (Korea) 5. *koreana*

6b. Tepaltube 11—13 mm. long:

7a. Tepalsegs lanceolate, acute; flowers flesh-colored to light rose (Central China) Fig. 14 ....6. *incarnata*

7b. Tepalsegs linear-lanceolate, or linear-oblong; flowers usually blood-red-scarlet, rarely white or apricot fading to gray (Japan) ....7. *sanguinea*

1b. Perigone distinctly irregular; leaves usually with lighter stripe or band in center (except in *L. caldwellii):*

Subgenus 2. **LYCORIS**

8a. Flowers not saffron yellow or cadmium orange; widest leaves up to 1.5 cm. wide:

9a. Flowers red or clear pink; tepaltube up to 5 mm. long:

10a. Flowers red; leaves 6—9 mm. wide (China & Japan) Plate 2....8. *radiata*

10b. Flowers clear pink; leaves broader (China) ....9. *rosea*

9b. Flowers not red or clear pink; tepaltube 4—23 mm. long:

11a. Stamens and style much exserted from the perigone, tepaltube 4—11 mm. long; leaves produced in autumn, with whitish stripe in center:

12a. Tepaltube 4—6 mm. long:
Tepalsegs 3.5—4.1 cm. long, 5.2—12 mm. wide; flowers straw-colored, sometimes flecked reddish; chromosomes 2n=16 (China) ....10. *straminea*

12b. Tepaltube 8.5—11 mm. long; leaves medium or dark green:
  13a. Umbel tightly packed; leaves medium green, Tepalsegs quite variable in size and shape, 3.3—4.4 cm. long, 6—12 mm. wide; flowers pale creamy-colored with pinkish band in center of tepalsegs; chromosomes $2n=17$ (Japan) ....11. *albiflora*
  13b. Umbel loosely packed; leaves dark green; Tepalsegs 4.8—5.1 long, 11-13 mm. wide; flowers cream-white, slightly deeper colored in center of tepalsegs, turning whitish with age; chromosomes $2n=30$ (China) Plate 3 ....12. *houdyshelii*
11b. Stamens shorter than, and style subequaling, the tepalsegs; leaves produced in February; without whitish stripe in center, and dark green: Tepaltube 20—23 mm. long; flowers peach colored in bud, opening to pale yellow, changing to creamy-white with age; tepalsegs 7.2 cm. long (China) Plate 4 ....13. *caldwellii*
8b. Flowers saffron yellow or cadmium orange:
  14a. Leaves glabrous, lorate-lanceolate; spathe-valves ovate, 4 cm. long; flowers saffron yellow, tepaltube 19 mm. long; tepalsegs narrowly-oblanceolate, 12—15 mm. wide (Formosa?) Fig. 13 ....14. *traubii*
  14b. Leaves glaucous, almost elliptic; spathe-valves lanceolate, 8 cm. long; flowers cadium orange; tepaltube 12 mm. long; tepalsegs narrowly-elliptic, 10—11 mm. wide (China) ....15. *aurea*

LYCORIS HAYWARDII [Fig. 16]

Lycoris sprengeri Comes ex Baker produces rose-carmine-prussian blue flower, not widely open, in Sept.-Oct. *L. haywardii,* which produces smaller orchid-purple-hyacinth blue flowers with tepalsegs outward-spreading in July-August, is related to the former. However, due to effective reproductive isolation imposed by the difference in time of flowering, *L. haywardii* has to be recognized as a distinct species. There are other differences as shown by the following description. Some of these are discussed by Mr. Caldwell in another article which appears in the present issue of HERBERTIA (Caldwell, 1957).

Lycoris haywardii Traub, **sp. nov.**

Umbella 4- vel 5-flora, floribus rubello-violaceis, cum caeruleo hyacinthi notatis, tubo tepalorum 1.1 cm. longo, segmentis tepalorum 4.4 cm. longis 6 mm. latis, staminibus quam segmentis tepalorum brevioribus, stylo a perigonio paulo exserto.

DESCRIPTION.—*Chromosomes,* $2n=22$ (Bose, 1957). *Bulb* globose. *Leaves* produced in late January—early February, persisting until spring, deep green, glaucescent, 46—48 cm. long, 8—9 mm. wide in the middle, apex rounded, tapering to 6—7 mm. at the base. *Scape* produced July to mid-August, about two weeks before its nearest relative, *L. sprengeri,* 27.5 cm. tall, solid, 9 x 7 mm. diam. at the base, narrowing to 6 x 4 mm. at the apex. *Spathe-valves* 2, free, up to 3.7 cm. long, lanceolate; bracteoles filiform. *Umbel* 4—5-flowered. *Pedicels* 1.4—2.3 cm. long. *Ovary* 4—6.5 mm. long. *Perigone* smaller but deeper colored than *L. squamigera,* and slightly lighter colored than *L. sprengeri;* it is wider open than *L. sprengeri* and the tepalsegs are less overlapping, and less reflexed up to 5.5 cm. long, in the reddish-violet range, orchid purple (Wilson, 31/2), with a somewhat deeper mid-rib, changing to hyacinth blue (Wilson, 40/1 or 40) at the apexes, particularly the setsegs. *Tepaltube* up to 1.1 cm. long, 4 mm. in diam. at the base, enlarging to 6 mm. in diam. at the apex. *Tepalsegs* oblanceolate, setsegs up to 4.4 cm. long, 6 mm. wide at the base, 11 mm. wide 3/4 from the rounded apexes; petsegs up to 5 mm. wide at the base, 10 mm. wide 3/4 from the rounded apex. *Stamens* somewhat shorter than the tepalsegs. *Style* moderately exserted from the perigone; *stigma* almost pointed. *Anthers* with yellow pollen. Stamens and style reddish-purple in color. Habitat: Japan.

SPECIMENS: No. 554 (holotype, TRA), Sam Caldwell, Nashville, Tenn.; No. 291 (paratype, TRA), 6-24-53, Wyndham Hayward, Winter Park, Fla.

NOTES.—According to Caldwell, the type plants of *L. haywardii* are self-fertile, and the seeds are large, shiny, black; the plants are resistant to cold and are considered as frost hardy at Nashville, Tenn.

LYCORIS HOUDYSHELII [Plate 3]

In 1948 Mr. Hayward imported four kinds of *Lycoris* from a Chinese nurseryman in Shanghai just before the Chinese mainland was taken over by the communists and all commercial contact was broken off. One of these lots was labeled ''Lycoris alba''. When it flowered for Mr. Hayward in late June-July 1953 in Florida and for Mr. Caldwell in Tennessee, it was at once apparent from specimens sent to the writer that this plant differed from its nearest relatives, *Lycoris albiflora* Koidz. and *L. straminea* Lindl. The new species had broader dark green leaves, wider tepalsegs and differed from its relatives in other characters as indicated in the description which is given below. It should also be noted that *Lycoris houdyshelii* has a unique chromosome complement for the genus, 2n=30 (Bose, 1957), which contrasts markedly with those of *L. straminea,* 2n=16 and *L. albiflora,* 2n=17 (Traub & Moldenke, 1949). The new species is among the finest Lycoris of all when bloomed under optimum conditions as is seen in the photograph taken by Sam Caldwell in his Tennessee garden (Plate 3). The new species has been named for Mr. Cecil Houdyshel, of La Verne, Calif., the fine gentleman who has done so much to gladden the hearts of gardeners by specializing in beautiful rare plants, including *Lycoris,* which are sold at reasonable prices.

Mr. Hayward writes with reference to *Lycoris houdyshelii* that ''it is clear milky white, almost an oyster white, with sparkling brilliance in full sunlight.''

Lycoris houdyshelii Traub, **sp. nov.**

Umbella 6- vel 8-flora, floribus flavido-albis, interdum rubello-penicillatis, tubo tepalorum 8.5 mm. longo, segmentis tepalorum 4.5 cm. longis 8 mm. latis, genitalibus a perigonio multo exsertis, paraperigonio labriformi brevissimo paene microscopico.

DESCRIPTION.—*Chromosomes,* 2n=30 (Bose, 1957). *Bulb* globose, 2.8—3.8 cm. in diam. *Leaves* deep green, appearing in September, persisting to spring; 6—8 per bulb, 33—42 cm. long, 10—13 mm. wide in upper 1/4, apex rounded, gradually narrowing to 8—9 mm. wide at the base, slightly lightening in color along the upper center. *Scape* produced in late July-August, 41.5—51 cm. tall, 7.5 x 11 mm. to 9 x 11.5 mm. in diam. at the base, 4.2 x 5.5 to 5.5 x 5.7 mm. in diam. at the apex, light green. *Umbel* 6—8-flowered. *Spathe-valves* 2, free, papery, medium brownish, lanceolate, up to 8 mm, wide at the base, 2.5—3.3 mm. long, acute at the apex; bracteoles much smaller, some filiform. Perigone irregular but not extremely so, margins of the tepalsegs slightly ruffled, particularly in mid-portion, cream-white, slightly deeper colored in the middle of the tepalsegs, turning whitish with age, sometimes slightly penciled pinkish; filaments cream-white, sometimes pink-tinged, style cream white, pink tipped. *Tepaltube* 8.5 mm. long, 4 mm. in diam. at the base, 6 mm. in diam. at the apex. *Paraperigone* a very short, almost microscopic transparent rim. *Tepalsegs* up to 4.5 cm. long, up to 8 mm. wide, linear-oblong to linear-oblanceolate. *Stamens* and *style* declinate-ascending, much exserted from the perigone. Anthers 3—4 mm. long. Style overtopping the stamens; stigma minute, almost pointed. Habitat: China.

SPECIMENS: No. 549 (holotype, TRA), 8-17-56; Nos. 550 & 551 (isotypes, TRA), 8-17-56, Sam Caldwell, Nashville, Tenn.

NOTES.—According to Sam Caldwell, this species is fully frost hardy at Nashville, Tenn.

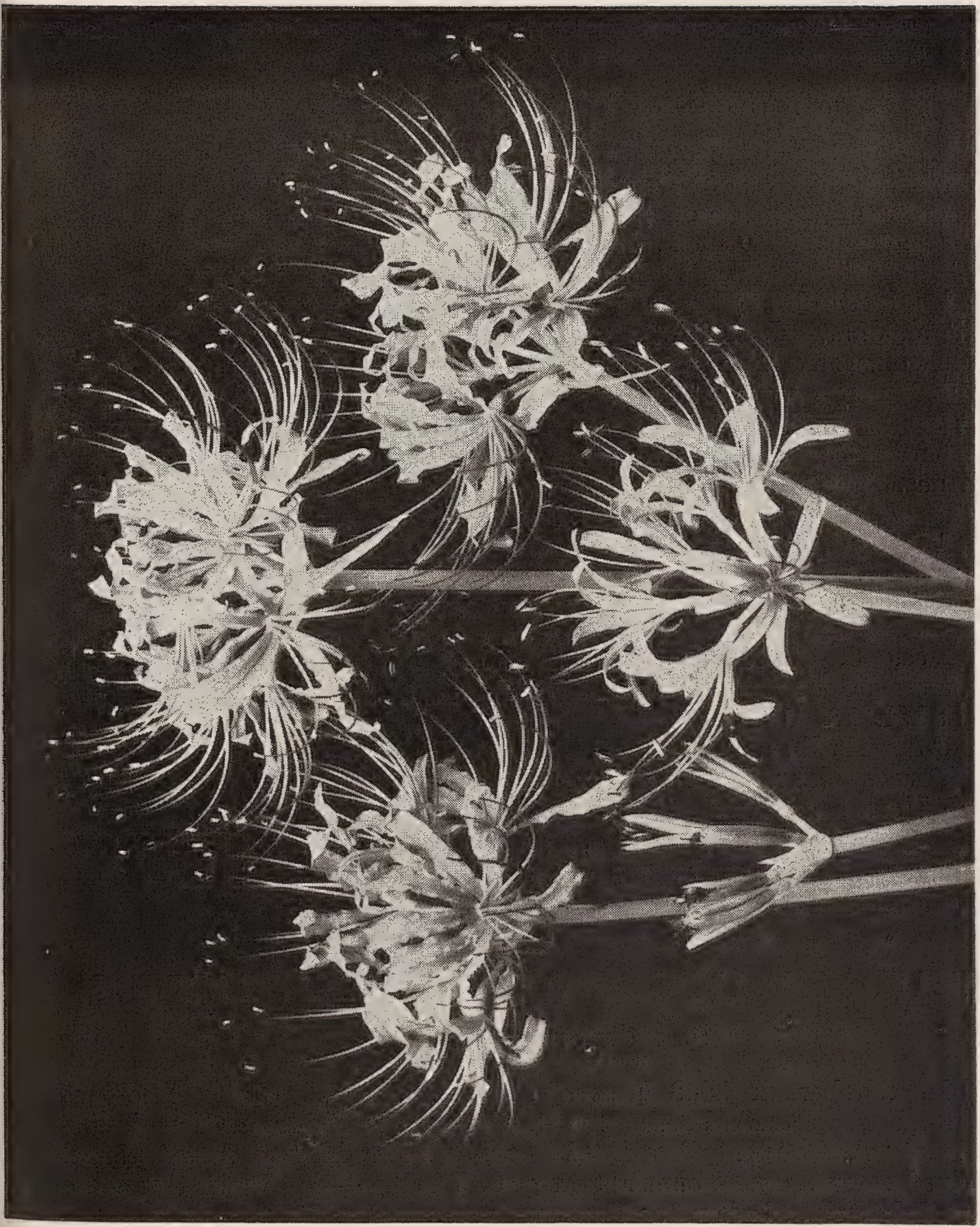
LYCORIS CALDWELLII [Plate 4]

Lycoris caldwellii differs from all of the species in subgenus 2. *Lycoris* in having stamens shorter than, and the style subequaling, the tepalsegs, a longer tepaltube, 20—23 mm. long, and dark green leaves without the whitish stripe in the center. There are other differences as shown by the following description. Some of these are discussed by Mr. Caldwell in another article appearing in the present issue of HERBERTIA (Caldwell, 1957).

Lycoris caldwellii Traub, **sp. nov.**

Umbella 5 flora, floribus pallide flavis demum flavido-albis, tubo tepalorum 20—23 mm. longo decurvato, segmentis tepalorum 7.2 cm. longis 1.4 cm. latis, staminibus quam segmentis tepalorum paulo brevioribus, stylo segmentis tepalorum subaequanto.

DESCRIPTION.—*Chromosomes*, 2n=27 (Bose, 1957). *Bulb* globose, about 2.5—3.8 cm. in diam., fairly long-necked. *Leaves* similar to those of *L. squamigera* but narrower, appearing in February and persisting to spring, 33—36 cm. long, 9—12 mm. wide at the middle, apex rounded, tapering to 6—7 mm. wide at the base. *Scape* produced in late August—September, up to 52.5 cm. tall, green, solid, 1.1 cm. in diam. at the base, 6 mm. in diam. at the apex. *Umbel* 5-flowered. *Spathe-valves* 2, free, narrow-linear, about 3.4 cm. long, soon withering. *Pedicels* slender, usually 1.1—1.7 cm. long, rarely up to 3.3 cm. long. *Ovary* 7—9 mm. long. *Flowers* in bud peach-colored, opening to pale yellow, changing gradually to creamy-white with aging. *Tepaltube* 20—23 mm. long, curved downwards, somewhat flattened on the sides, 3.5 x 4.5 mm. in diam. at the base, 5.5. x 7.5 at the apex. *Tepalsegs* up to 7.2 cm. long, narrow-linear-lanceolate, slightly undulate on the margins, apexes re-



Lycoris radiata (L'Hérit.) Herb., self-fertile form, as grown at Nashville, Tennessee. Photo by Sam Caldwell.

Plate 2

curved, 1.4 cm. broad; setsegs with pointed cusps, and petsegs rounded at the apex. *Stamens* slightly shorter than the tepalsegs. *Style* subequaling the tepalsegs. *Stigma* pointed. Habitat: China.

SPECIMENS: No. 552 (holotype, TRA), Sam Caldwell, Nashville, Tenn.; No. 222 (paratyle, TRA), 9-6-54, Sam Caldwell, Nashville, Tenn.

NOTES.—According to Sam Caldwell, this species is hardy at Nashville, Tenn.

CHROMOSOME DATA AND HYBRIDIZATION

The available chromosome data has been summarized by Traub and Moldenke (1949), and Bose (1957). This shows that out of the 15 species recognized, chromosome data for only four species is lacking. Plants are available of *L. incarnata* and *L. traubii* and this data will most likely be supplied by Mr. Bose in a later issue of HERBERTIA.

Mr. Bose (1957) has made progress toward the interpretation of the available data. Hybridization may have had an effect on the evolution of the chromosome numbers. Creech (1952) reports progeny when the fertile biologic type of *Lycoris radiata* (L'Hérit.) Herb. [Plate 2], $2n=22$, was pollinated by *L. aurea* ($2n=12, 13, 14$). The chromosome number in the hybrid as reported is $2n=19$. It is hoped that further chromosome studies of this hybrid may be made. The intermediate species, *L. albiflora,* $2n=17$, and *L. straminea,* $2n=16$, could have originated by hybridization.

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Traub, Hamilton P. and Harold N. Moldenke. Amaryllidaceae: Tribe Amarylleae. 1949.

FOUR NEW **LYCORIS** FOR AMERICAN GARDENS

SAM CALDWELL, *Tennessee*

In October of 1948 I received from Mr. Wyndham Hayward, Winter Park, Florida horticulturist, three or four bulbs each of *Lycoris* *"alba," "L. incarnata"* and *"L. aurea".* Mr. Hayward had himself received these bulbs—about 100 of each, I believe—in a shipment out of Shanghai, China, before the Communists took over there.

At that time I was planting small groups of all the lycoris species I could obtain, in an effort to determine which ones would prove hardy enough for outdoor culture in middle Tennessee and which ones might be adaptable as pot plants.

As the years passed it became evident that Mr. Hayward had "hit the jackpot" in his Shanghai shipment. All of the original labels have proved to be incorrect. But the bulbs are treasures—each of the three kinds is new to cultivation, or so it appears at this time. They make up an amazingly varied and beautiful trio of lycoris. Scarcity of stock will restrict them to the collections of plant connoisseurs for some years, but eventually they should be widely grown.

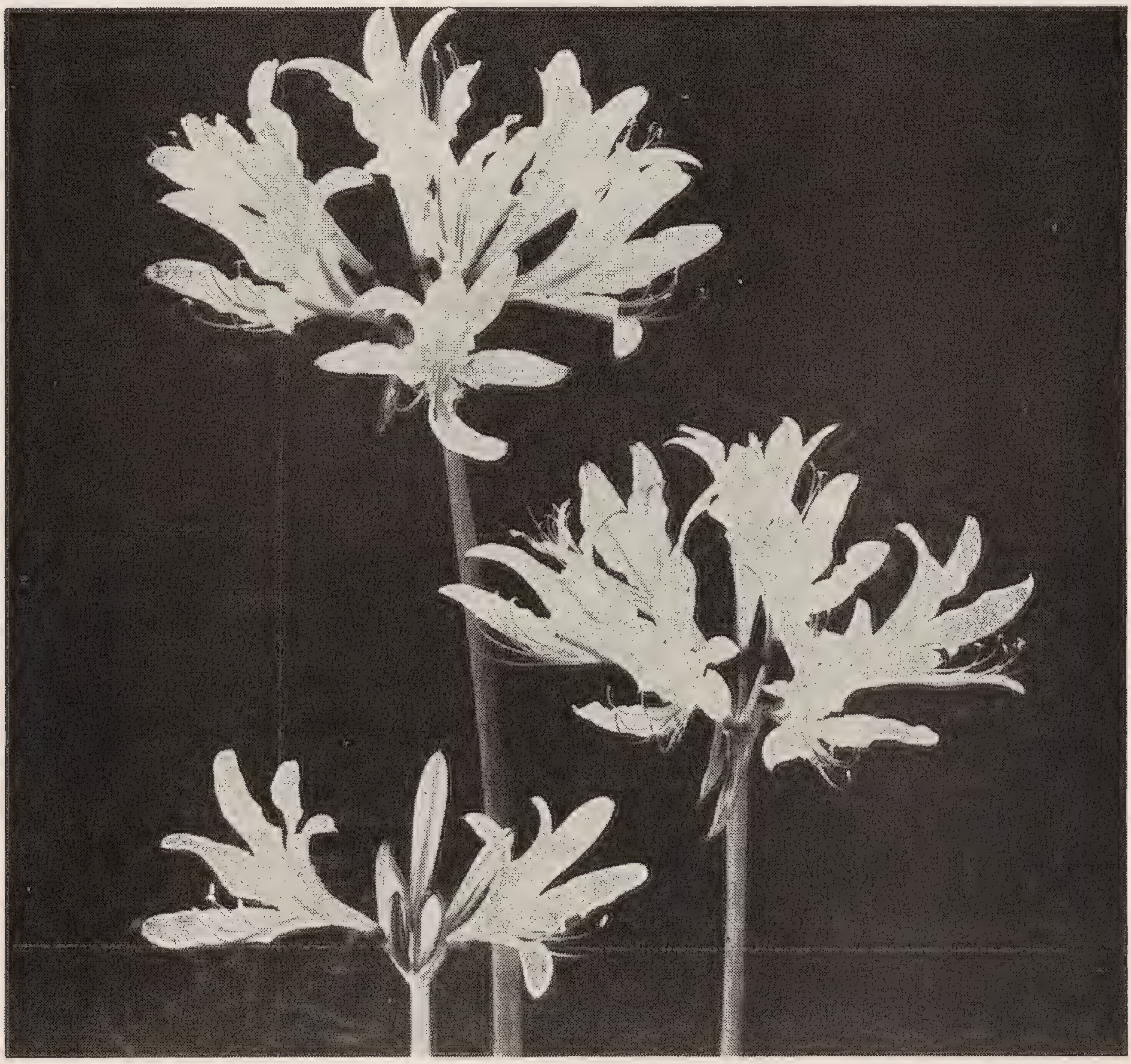


Fig. 14. *Lycoris incarnata* Sprenger. Photo by Sam Caldwell, Nashville, Tenn.

These species have been named *L. houdyshelii, L. haywardii* and *L. caldwellii.* In addition one apparently un-named species is also discussed and illustrated in the present paper. Naturally I'm pleased and flattered that one should be called in my honor. Actually, my part in the "discovery" was almost accidental. I merely planted the bulbs back in 1948 and left them alone. Three years later, one of them flowered, and after six years all had bloomed.

Below are separate notes on the three species as I grow them. Certain general information applies for all of them. All have grown out of doors at my farm near Nashville, Tennessee since the fall of 1948 (except one group which remained in a pot for the first two years). They are in a well drained brownish loam soil testing about 6.2 on the pH scale. Winters get much colder here than is generally realized. Night temperatures during January and February may fall to a few degrees above zero, or even a few below. Most unusual, and the very coldest on record, was 13 below zero registered on February 1, 1951. Luckily, about eight inches of snow and ice blanketed the ground at that time, and my lycoris were not damaged.

Our cold spells may last two or three weeks and the ground freezes, of course, but milder periods always come to break up the cold. There is much freezing and thawing—quite damaging to many plant materials. But we do not have the deep, hard, all-winter freezing of the ground which most northern gardeners experience, so I cannot say how these lycoris will stand that condition.

Lycoris squamigera is dependable here, barring severe late freezes that damage the growing foliage. So also is *L. sprengeri*. *Lycoris incarnata* [Fig. 14] does well, too, but its foliage—on which subsequent blooms depend—is more often damaged by cold than are the leaves of *squamigera* and *sprengeri*. *Lycoris radiata* is better known here than any of the other species and is reasonably satisfactory. However, it is not so floriferous here as in Georgia, Alabama and other states where winters are milder. After a particularly "rugged" winter, which noticeably flattens and "burns" the leaves on *L. radiata*, we have relatively light bloom the next fall. *Lycoris aurea* is hopeless outdoors here, though it is a good pot plant in a cold greenhouse.

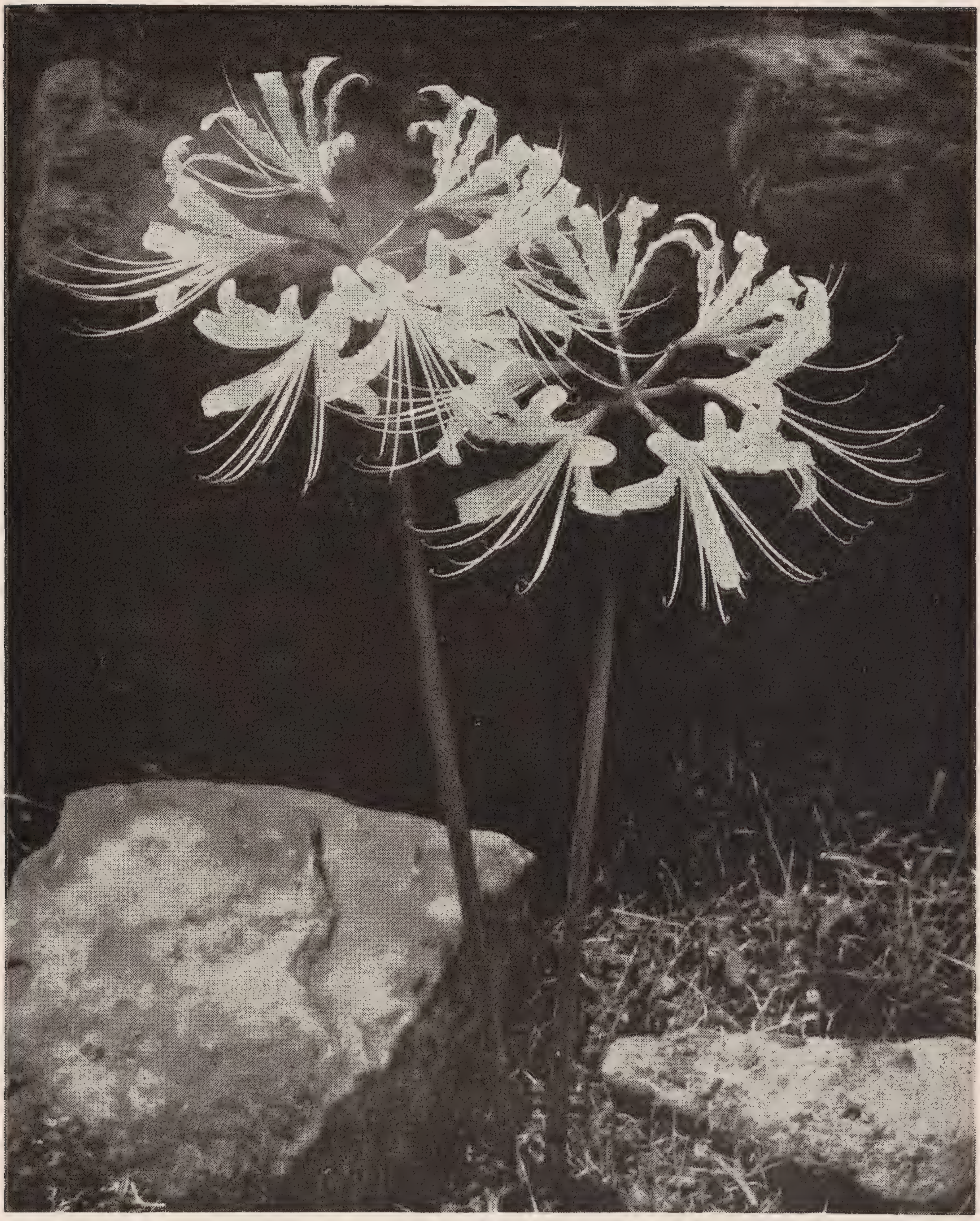
LYCORIS HOUDYSHELII [Plate 3]

The three bulbs I received in October, 1948, as *L. "alba,"* looked much like bulbs of *L. radiata;* they were rounded, about one and a quarter inches in diameter and had short necks. All roots were gone, but the dried remains of a flower scape hung on one bulb, indicating at least that they were of flowering size. Because I wasn't sure about the hardiness of this species, I put two bulbs in a pot and the other out in the ground.

No growth at all appeared for a full year. In October, 1949 deep blue-green leaves began to push up on the outdoor bulb and on one only of the potted bulbs. The other bulb in the pot was dead.

From the first this lycoris gave promise of being something "different," and I think it has remained my favorite. I had most of the kinds then available, including several other *"albas," "radiata albas,"* and *albifloras*, but the foliage on this Shanghai *"alba"* was distinctive—wider, longer and a deeper green than the leaves of any of the others.

Now that the bulbs are well established, foliage usually appears in September each year—six to eight leaves from each bulb. Leaves are eight to twelve inches long and a half to three quarters of an inch wide, with a distinct midrib. There is a little lightening of color along the midrib but not such a definite band of lighter color as in the leaf of *L. radiata*. Leaves persist all winter—indeed, I judge that they are more



Lycoris houdyshelii Traub, *sp. nov.*, as grown at Nashville, Tennessee. Photo by Sam Caldwell.

Plate 3

resistant to cold than the leaves of *L. radiata*—and they die away in spring.

The first bloom came on the outdoor-planted bulb, on August 22, 1951—a sturdy scape 22 inches tall with six big flowers about two and three-quarters inches across, making a large umbel. With the outward radiating stamens and pistils the umbel is about eight and a half inches across. The flowers open with a cream-white tint and then turn clear white; pistils are white, tipped pink, and the anthers carry yellow pollen.

On very close inspection it is possible to find an occasional red hair-line mark along a flower segment, as though traced with a fine-pointed pen. Appearance of these lines is erratic, and they are so thin as to be hardly noticeable from a short distance. They are more likely to be long near the edge than the middle of a segment, and some flowers have none at all. They detract in no way from the over-all pure white effect of the umbel.

I was so excited over this big, stunning blossom that I called Mr. Hayward over the long-distance telephone and told him about it. He was greatly interested, as none of his own bulbs had bloomed, nor had he any reports of bloom from anyone else to whom he had supplied this species.

There were no flowers the next year, but two fine scapes with eight flowers each opened August 17, 1953. Again skipping a year, the bulbs came back with two excellent scapes (six flowers on each) on August 20, 1955. It was then that I made the accompanying photographs to preserve an impression of the great beauty of this outstanding lycoris.

It is good to know that we really have a new species here and that it has been named for Mr. Cecil Houdyshel, the fine gentleman of La Verne, California, who has brought so much happiness to gardeners by choice and rare plants.

Incidentally, I dug, divided and reset my bulbs of this species just after the 1955 blooms faded. They had increased at a very conservative rate. From two original bulbs (the potted one had been transferred to the ground in 1951) I had exactly ten bulbs—all of good size, one and one-eighth to one and one-half inches in diameter. There were no small offsets whatever.

Though moved ''bare root,'' the bulbs were lifted and reset quickly and carefully, so that the white roots were not broken and did not dry out. I was delighted in mid-August, 1956, to see five fine scapes push up on these bulbs transplanted only the year before. In their new location they have more moisture than before and also are shaded for about half the day. As a result of this, apparently, the flowers last longer—about a week in good condition. The color tends to remain cream-white instead of reaching the snowy whiteness of the blossoms produced out in full sun, but they are still very beautiful. One most interesting effect is that when the blooms are three to four days old they become flushed with irregular patches of rosy pink along the segments, and the filaments and styles turn pink on the upper side only, remaining white underneath. It appears as though light from above might cause the color change.

Thus far I have not been able to make this lycoris set seed, but its pollen has proved fertile in a cross I made on my fertile strain of *L. radiata.*

LYCORIS HAYWARDII [Fig. 16]

My three original bulbs, labeled "*L. incarnata,*" ranged from three-quarters to one and one-eighth of an inch in diameter and were rather long and less globe-shaped than those of *L. houdyshelii.* They had no roots. Again, for test purposes, I planted one in the ground and two in a pot, in October 1948.

The bulbs evidently took a long time to make roots, for no leaves showed up until March, 1950, when rather weak, narrow blue- or gray-green blades pushed up. In later years, with bulbs well established, the foliage has started in late January or early February—just one to two weeks after foliage starts on my true *L. incarnata.*

For the first three or four years I felt that this lycoris was too tender to "take" our winters. The sickly little foliage clumps collapsed during cold spells and showed definite signs of injury. The bulbs apparently gained vigor with age, however, as they now make wider, deeper green leaf blades, with much less of the glaucous appearance so noticeable in the earlier foliage. In fact, the mature leaf clumps look like those on *L. incarnata* and *L. sprengeri,* and seem to be quite as resistant to cold as are the leaves of *incarnata.* I would rate it as "hardy" here. The leaves die down, of course, when warm weather comes in spring, as does all the lycoris foliage.

From the beginning the foliage on these bulbs had a general resemblance to that of *L. incarnata,* and since I had received them under that name, I assumed that they were correctly labeled. Knowing *L. incarnata* to be hardy here, I transferred the two potted bulbs to the ground in the fall of 1950.

The winter of 1952-'53 was unusually mild for us; 18 degrees above zero was our lowest temperature, and all lycoris foliage held up exceedingly well. As a result, the summer and fall of 1953 brought the best lycoris bloom I've ever had. Not one, but four scapes began pushing upward from these bulbs in late July and on the 29th of the month they were in full bloom. The 18-inch scapes carried four flowers each, individual flowers measuring two and three-quarters inches across. At once it was evident that here again was something new—not *L. incarnata* at all.

My photograph shows the bloom form of *L. haywardii* very well. The color is an orchid pink, deepest along the segment midribs, with conspicuous streaks and patches of blue at the tips, much as in the case of *L. sprengeri* [Fig. 15]. In fact, this lycoris is going to be confused with *L. sprengeri.* However, there are differences, and I have included a picture of *sprengeri* to help make them clear. By looking at the two pictures carefully it will be noted that the flowers of *L. haywardii* have a decided "flare"—the "petals" are less overlapping and less rolled back at the tips than in the *sprengeri* blossoms. My impression, too, is that the coloring in *L. haywardii* is just a little lighter than in *L. sprengeri,* though it has not been possible to make a direct comparison. *Haywardii* blooms for me a week or more before *sprengeri,* and the last *haywardii* flowers are faded before the first *sprengeri* bloom opens.

Incidentally, *L. haywardii* seems quite generous in bloom production. Following the four scapes in 1953, there were nine scapes in mid-August of 1954. I feel that steady bloom would have continued in '55 but for the fact that a disastrous 16-degree freeze on March 25, 1955 ruined all lycoris foliage, which had previously been lured into soft, lush growth by several weeks of 70-degree weather. Even the usually reliable *L. squamigera* didn't bloom in '55.

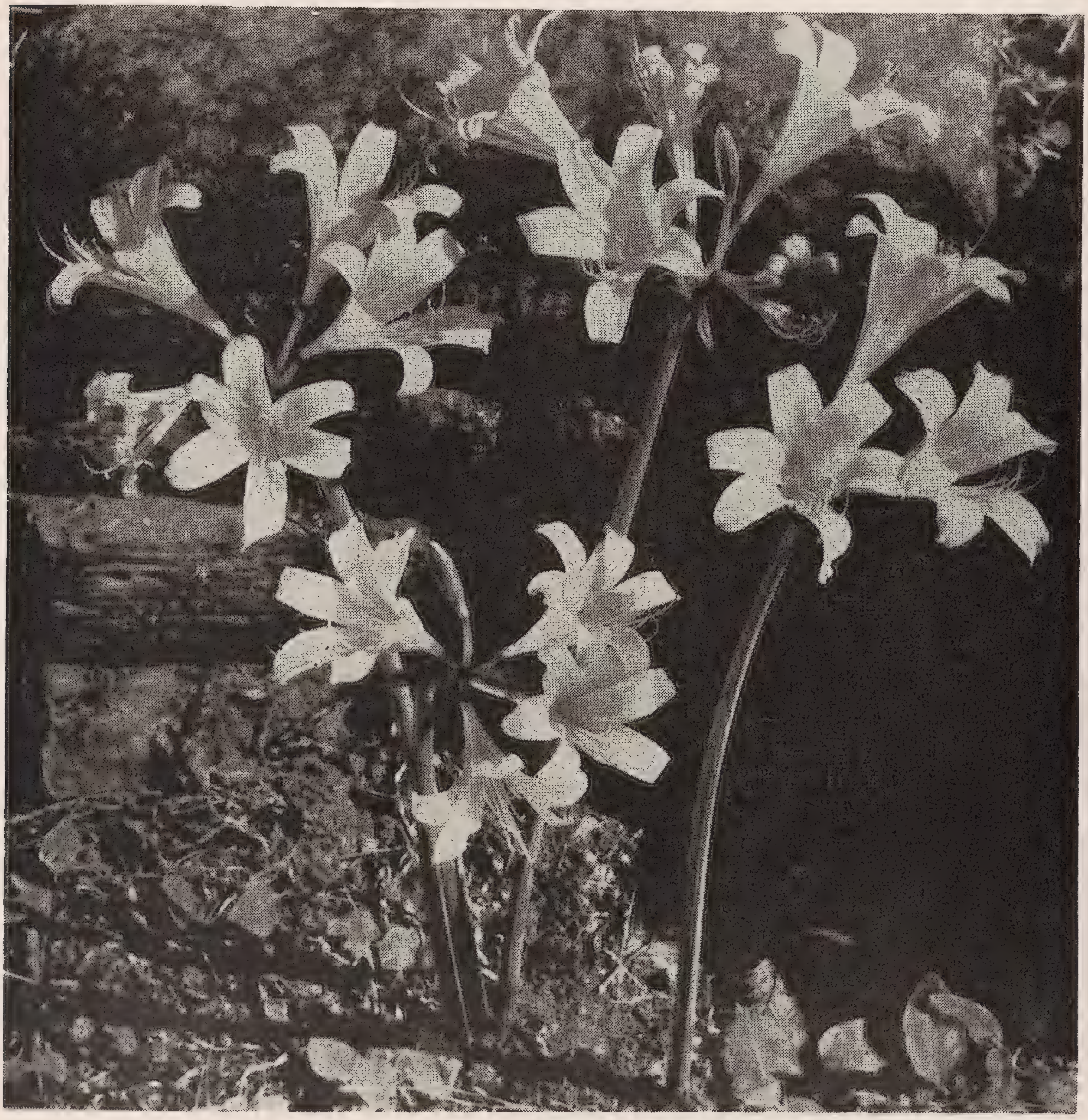


Fig. 15. *Lycoris sprengeri* Comes ex Baker, as grown at Nashville, Tennessee. Photo by Sam Caldwell.

To most observers, *L. haywardii* will be somewhat between *L. squamigera* and *L. sprengeri* in appearance; it is smaller but deeper colored than the former and a bit lighter than the latter. Altogether it is a fine lycoris and should be particularly valuable in Florida and the Lower South, where *L. squamigera* does not bloom well. Mr. Hayward tells me that *L. haywardii* flowers freely at Winter Park, Florida.

For me it has set seed to its own pollen and made large, shiny black, viable seeds.

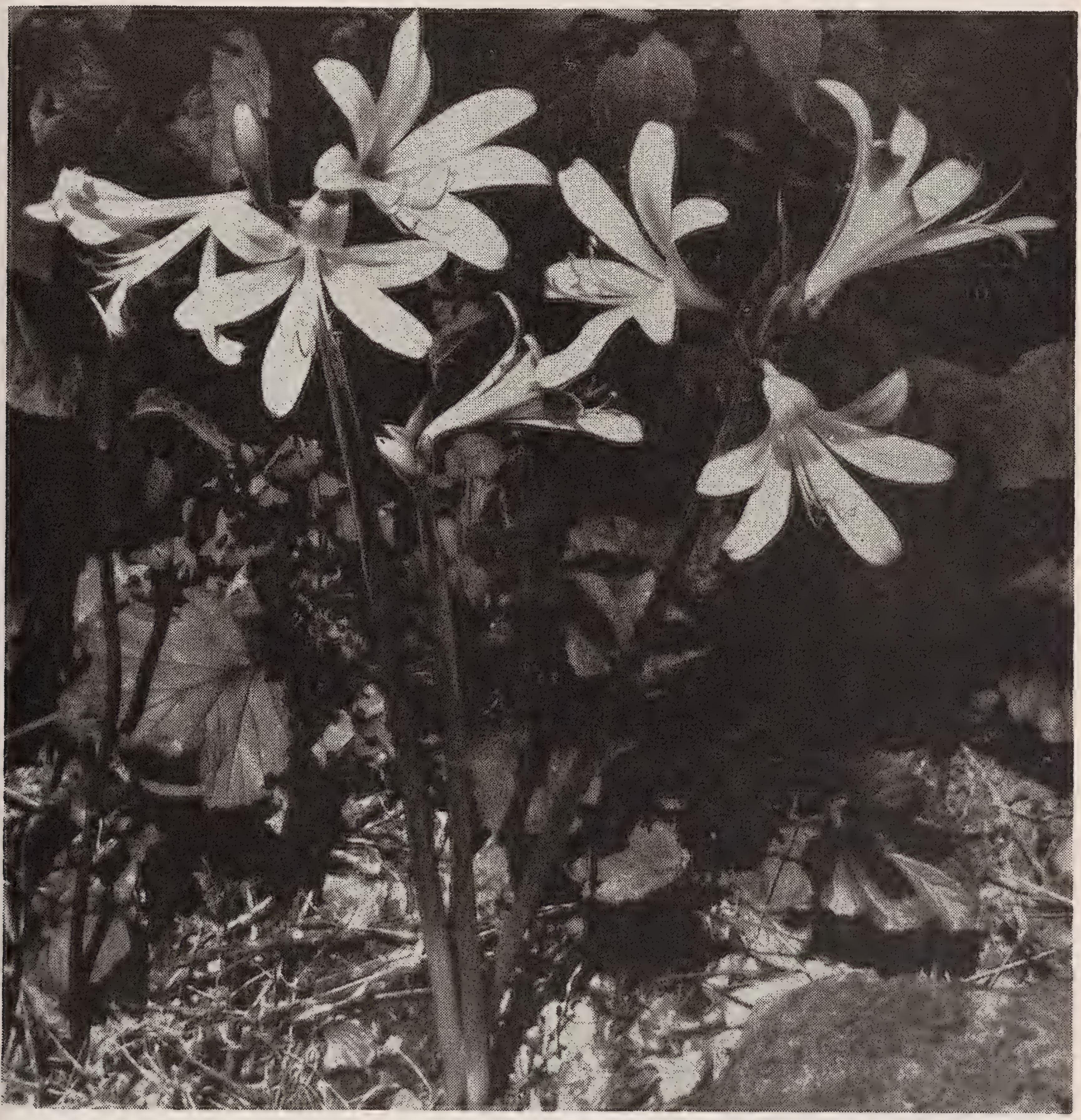


Fig. 16. *Lycoris haywardii* Traub, as grown at Nashville, Tennessee. Photo by Sam Caldwell.

LYCORIS CALDWELLII [Plate 4]

The four bulbs which came from Mr. Hayward in October, 1948 were approximately an inch and a half in diameter, fairly long necked and had no roots. They were labeled *"L. aurea,"* and as that species is not hardy here, I planted all of the bulbs in a large pot and wintered them in my cold greenhouse. Nothing happened for more than a year, and I thought the bulbs were dead. In January, 1950, however, four little clumps of leaf blades appeared in the pot. Curiosity about the ''clump'' formation made me dig down into the soil to investigate. I saw that each of the old bulbs apparently had disintegrated, but a number of small bulblets had formed and grown up out of the old basal plates.

From the appearance of the foliage on these little bulbs it was very clear that they were not *L. aurea.* I thought that they might be either *L. incarnata* or *L. squamigera*—both of which are hardy here. So I shifted the entire pot of bulblets to the ground, outdoors. They continued to grow along each year, starting their flat leaf blades up in February. Leaves were not quite as wide as those on *squamigera,* but otherwise they were very similar in appearance and growth habits.

Meanwhile, in September, 1951 Mr. Hayward sent me two more bulbs of this same lycoris—two firm, sound bulbs that he had nursed up to a good size—about an inch and a half in diameter, with fresh, live roots. I set them both in a ten-inch flower pot and wintered them in the cold greenhouse, where they made robust, *squamigera*-like foliage, starting in January. This died down in spring. In August, 1953 a scape started up out of the bare dirt in the pot, and I was intrigued by the ''peachy'' pink-yellow color of the buds. To make sure that grasshoppers wouldn't injure the flowers, I took the pot indoors. There were five buds, and to my disappointment, they opened only one or two at a time, so that there never was a complete umbel of flowers attractive enough to photograph. Perhaps it was the indoor light or some other factor that caused the ''staggered'' flower opening. As it later developed, this is not characteristic of the species.

The color, creamy yellow, struck me as unusual, but I was not greatly impressed by the flower and I mentioned it almost casually in a letter to Mr. Hayward about some other matters. Immediately he replied with a, ''WHAT IS THAT 'creamy yellow lycoris'? . . . Send a bloom to Dr. Traub. . . . Maybe you have a new species!''

Fortunately, the last of the five flowers in the umbel was still reasonably fresh, and I air-mailed it to Dr. Traub in Arcadia, California.

Even better, the next year, on September 1, 1954, I had two perfect scapes 21 inches high, with five flowers each, on my outdoor bulbs. This time there could be no doubt about the true color and appearance of the flowers. Again the buds started up with the color of a ripening peach—a blend of pink, salmon and yellow. Upon opening fully, however, the flowers displayed only a pale yellow color, and this changed gradually to cream-white with age.

I photographed the flowers (see accompanying pictures), then cut one scape and air-mailed it to Dr. Traub. Because I retained it for picture purposes until it was fully developed, and then it had the long trip to California in fearfully hot weather, I fear that little of the yellow tint was left when it reached Dr. Traub.

At that time I supposed this unusual lycoris might be *L. straminea,* but since then I've been advised that it does not conform to the type

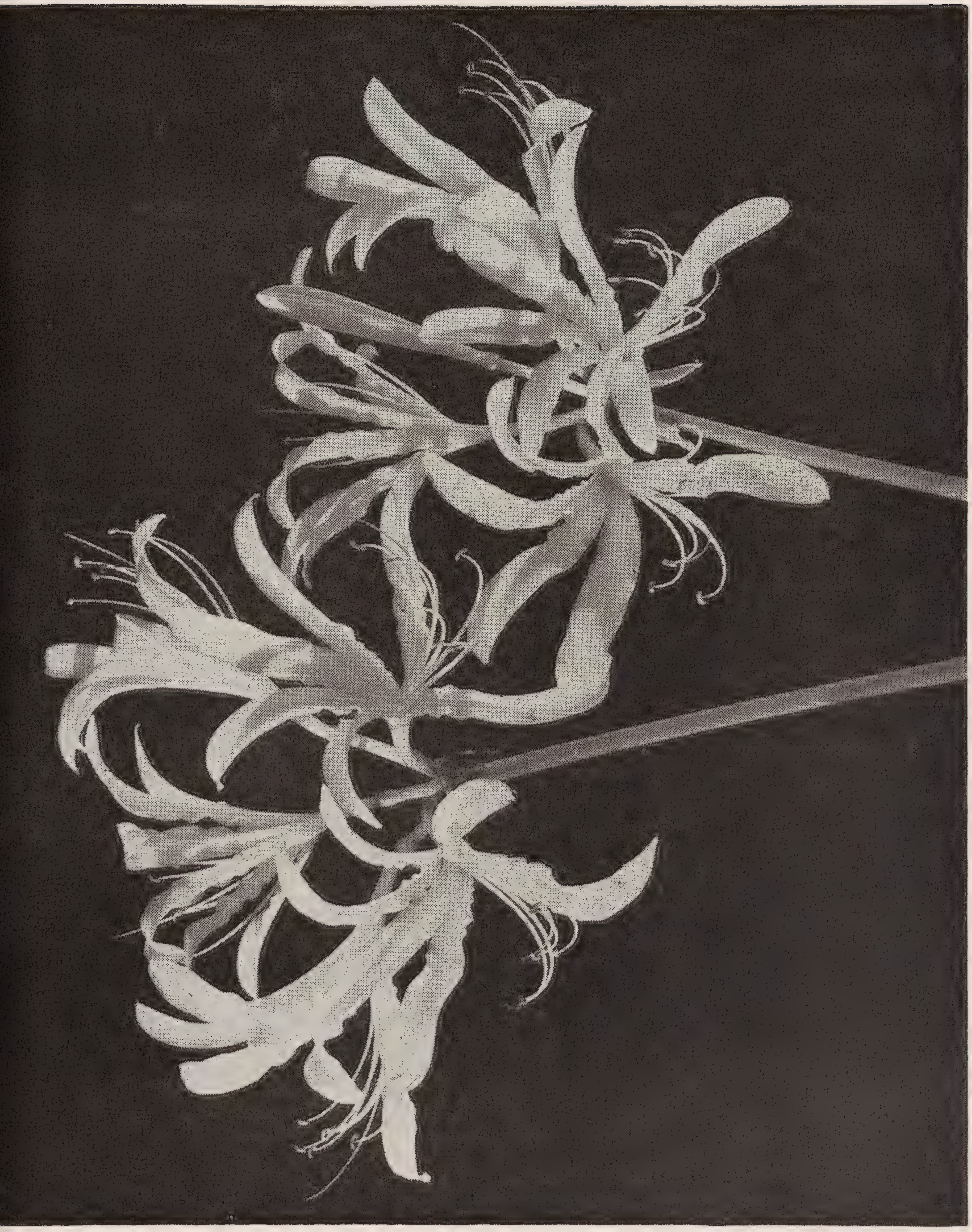


Plate 4

Lycoris caldwellii Traub, *sp. nov., as grown at* Nashville, Tennessee. Photo by Sam Caldwell.

material of *straminea.* I am told also that it is considered a new species, to be named for me. Regardless of the name, it is a most attractive lycoris and probably will turn out to be a satisfactory garden flower. There has been no real opportunity to determine whether it sets seeds, because I've cut two of the three scapes I've had thus far. But no seeds developed on the other one.

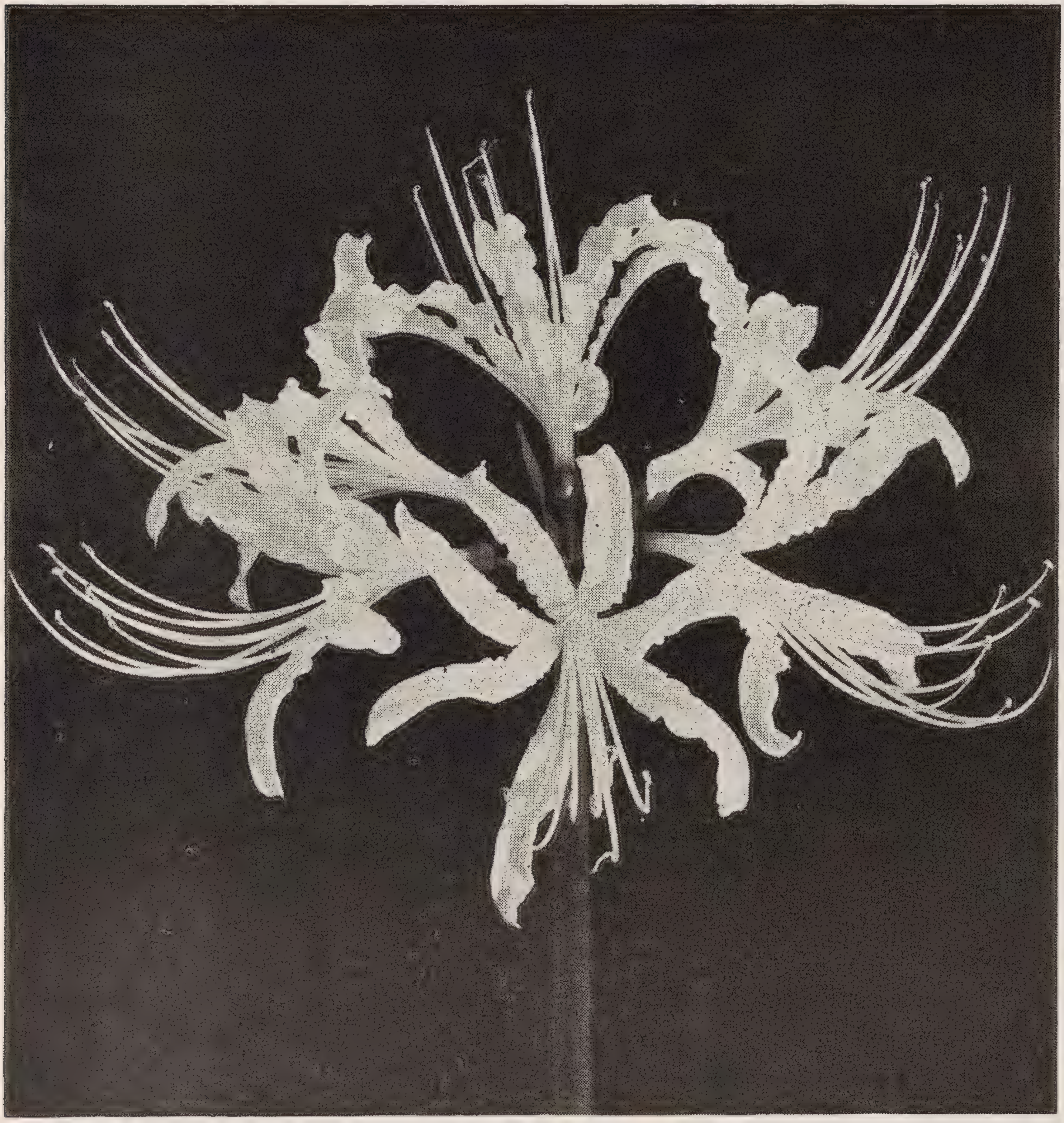


Fig. 18. *Lycoris* sp. (un-named), as grown at Nashville, Tennessee. Photo by Sam Caldwell.

AN UN-NAMED SPECIES [Fig. 18]

In addition to the three new named species discussed, there is a beautiful un-named species as shown in Fig. 18. It has very much the same growth habits as *Lycoris radiata* and flowers for me around the first of September. In flower it differs markedly from *L. radiata* as shown in the illustration. A more detailed report on this species will be included in the 1958 HERBERTIA.

THE LEOPARD AMARYLLIS REDISCOVERED

HAMILTON P. TRAUB AND IRA S. NELSON

During his 1954 collection trip to South America under the sponsorship of the Louisiana Society for Horticultural Science, the junior author brought back bulbs of an *Amaryllis* species from Bolivia that was later identified as the LEOPARD AMARYLLIS, *A. pardina* Hook f. (1867),

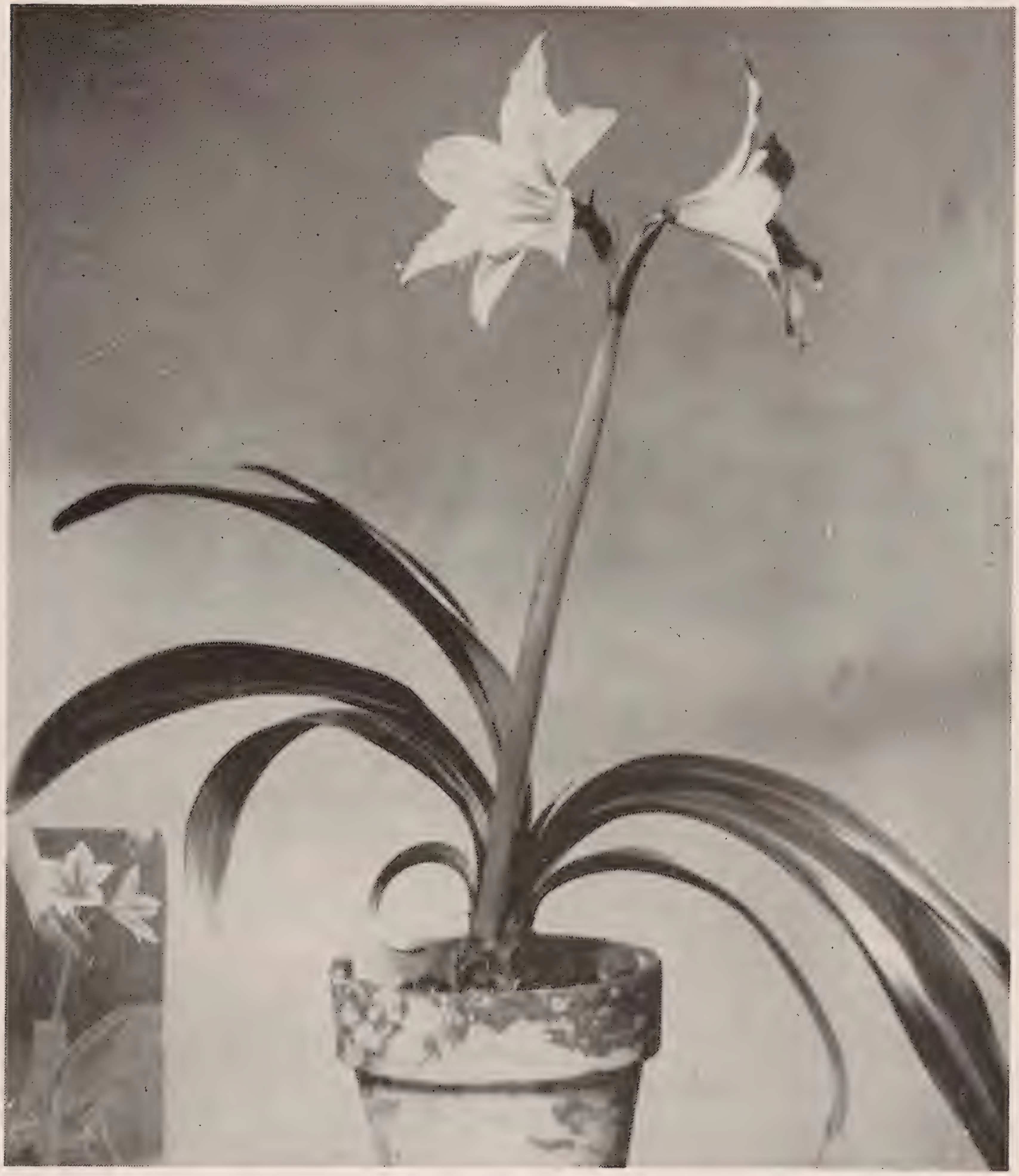


Fig. 19. *Amaryllis pardina* Hoof. f. (1867), collected by Ira S. Nelson in Bolivia, 1954; grown at Lafayette, Louisiana, 1955. In lower left corner, *A. pardina* collected by Mr. M. A. Carriker, Jr., Rio Beni region of Bolivia in 1931; grown by Dr. de Schauensee at Philadelphia in 1950.

first described from living specimens collected by Pearce in the Andes of South America.

Blooms from the bulbs collected by the junior author were obtained under greenhouse culture at Lafayette, Louisiana in April 1955 (see Fig. 19), and again in February 1956 when the plant was identified by the senior author from blooms sent by air mail to him at La Jolla, Calif.

There are several forms of this species. The two most common are white minutely dotted red, or yellow minutely dotted red. The first mentioned form is the one rediscovered and is the one pictured in Plate 19. In 1931, Mr. M. A. Carriker, Jr., collected this same form of the LEOPARD AMARYLLIS in the Rio Beni region of Bolivia, but unfortunately, it was never distributed, and is by now probably lost. The small inset on the lower left of Fig. 19 represents the Carriker plant from a photo taken by Dr. de Schauensee of Philadelphia. This form is an outstanding plant with tepalsegs fairly regular and it can be easily seen how this was a valuable asset in breeding the Leopoldii hybrids along with a species also with wide open, regular flowers, *Amaryllis leopoldii,* which has never been rediscovered.

It should also be noted that the flowers of *Amaryllis pardina* are very long lasting. The scape sent to the senior author on February 11, 1956 by air mail from Lafayette, La., was placed in water on arrival at La Jolla, Calif., and was still in prime condition when it was put in the plant press for the herbarium on February 17.

In a few years stock of this fine species should be available through plant dealers when the bulbs have been propagated in sufficient numbers.

AMARYLLIS FORGETII

REG. F. HARRADINE, *Potters Bar, England*
Corresponding Member APLS

In HERBERTIA 1956, pp. 34 to 37, are reports by Mrs. Edith Strout, Mrs. Paul Kane and Mr. L. S. Hannibal on an Andean *Amaryllis* species, thought to be *Amaryllis forgetii.*

Dr. Vargas, in 1955, sent me a parcel of bulbs which included nine of an *Amaryllis* species collected near Cuzco, Peru. They flowered very soon after being potted up, but in a weak, half-hearted manner. However, they made good growth and in due course showed the usual signs of wanting a resting period. I dried them off completely and kept them really dry for some two months or so. Then the tips of buds appeared on some, and these were given a good soaking and put on the bench in the heat, bringing them quickly into flower. The first bulb flowered in late July and the last bulb has just finished (Jan. 7, 1957).

This time all the flowers were perfect. Eight bulbs each gave two scapes, each scape having two flowers. The last bulb, smaller than the others, gave one scape with a single flower. There were no variations in flowers or foliage, one being an exact replica of the others.

The following description agrees very closely with that given in Traub & Moldenke—"Amaryllidaceae: Tribe Amarylleae" for *Amaryllis forgetii.*

Bulb small, about 1¾ inches diameter. Neck developed by the wrap-round bases of the leaves and measures about 2¼ inches from the true top of the bulb. Leaves 6, lanceolate tipped, growing with the scape, but developing fully after flowering, dull green, light at first, darkening in development, grey green on the back, ruddy for about four inches at the base, 24 to 26 inches in length, 1½ inches maximum width. Peduncle 21 inches, slender, tapering, maroon at base as in the leaves. Spathe valves 2½ inches long. Pedicels 1¾ inches. Flower stellate, arrogantly perfect, scentless, dull crimson (RHS 824/3), throat and keel bright green (RHS 60/3 to 60/1), forming a very attractive green star. The three upper tepalsegs are crimson to the tips, but the lower ones have much more green, particularly the center one, which appears more to be green oversplashed with crimson. The surface of the tepalsegs is distinctly 'quilted' (reticulated). Fully expanded flower measures about 5½ inches horizontally and 6 inches vertically. Paraperigone is incurved and bears tufts of white hairs about ¼ inch long. Stamens are about the same length as tepalsegs, the style exserted for ¼ inch beyond the lowest tepalseg. Stigma trifid.

Tepalsegs do not twist, but are very slightly reflexed. Crimson colour is very dull, particularly on the outside, not at all velvety and I see no outlining of the green star.

I gave one of the plants, in flower, to Kew. Unfortunately, Mr. Sealy was away, but opined that it was *Amaryllis forgetii.*

I find these plants require much water whilst in growth and definitely enjoy a dust dry resting period. When in flower they stand up to very high sun temperature without wilting.

Tried unsuccessfully to self it, but have a fine batch of seedling resulting from pollination with *A. reticulata striatifolia.* Leaves are now some three inches in length and all have the maternal leaf texture and colour, but a few have the paternal white stripe. Have used *A. forgetii* pollen on a Bolivian form of the American Belladonna, *A. belladonna L.* The seeds will soon be ripening.

AMARYLLID NOTES, 1956

HAMILTON P. TRAUB, *California*

Mr. L. S. Hannibal of Fair Oaks, California, sent in the photo of the blood-red flowered variety of *Crinum bulbispermum* (Fig. 20). The ordinary variety *roseum* is such a very light pink that it hardly deserves notice and it is good to know that a real red variety is now under cultivation in the United States. The variety was collected in Natal by Dr. Rodin of the California Polytechnic Institute.

Crinum bulbispermum var. *sanguineum, var. nov.* Varietas a forma typica speciei floribus sanguineis recedit.

Flowers blood-red. Native to Natal, South Africa.

Callipsyche eucrosioides var. *rauhiana* Traub, *var. nov.* Varietas a forma typica speciei floribus roseo-rubris et filamentis viridibus recedit.

Umbel 11-flowered; flowers rose-red, filaments green. Holotype: E-15 (HEID), Rauh-Hirsch, 8-30-54, Pasaje, Eucador, alt. 300 m.

Amaryllis gh. *reginaeoides* Traub, *gh. nov.* Hybridae inter species aliquot obviae (*A. reginae, A. vittata, A. psittacina, A. aulica, A. belladonna* L., *A. striata,* etc.), plantae maximae, flores maximi modice patuli.

Hybrids involving several species (*A. reginae, A. vittata, A. psittacina, A. aulica, A. belladonna* L., *A. striata,* etc.), plants very large; flowers very large, moderately open. Holotype: Traub No. 513 (TRA).

Amaryllis gh. *leopoldaeoides* Traub, *gh. nov.* Hybridae inter species aliquot obviae (*A.* gh. *reginaeoides, A. leopoldii, A. pardina*), plantae maximae, flores maximi patuli.

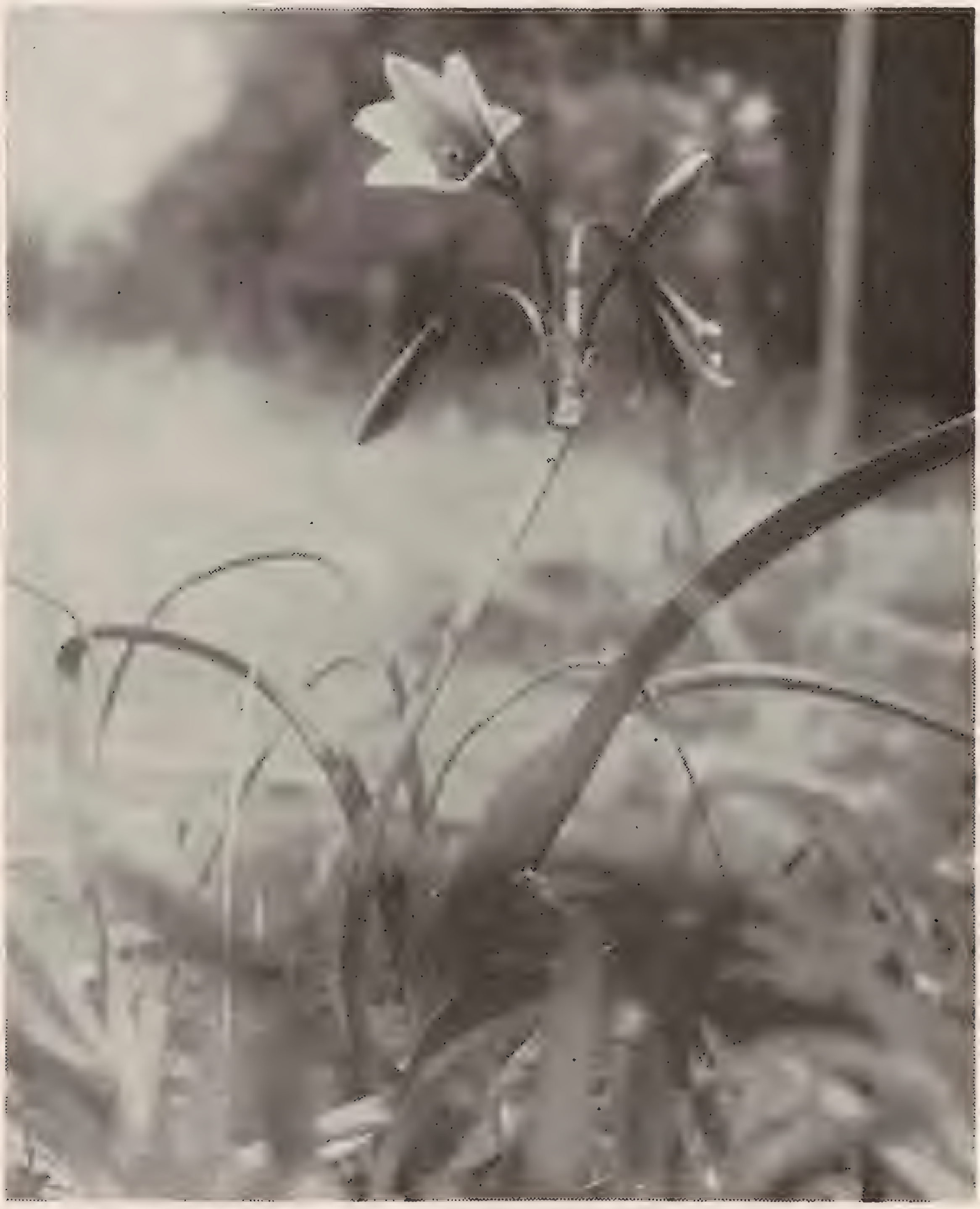


Fig. 20. *Crinum bulbispermum* var. *sanguineum,* as grown at Fair Oaks, Calif. Photo by L. S. Hannibal.

Hybrids involving several species (*A.* gh. *reginaeoides, A. leopoldii, A. pardina*), plants very large; flowers very large, wide open. Holotype: Traub No. 514 (TRA).

Hemerocallis gh. *yeldiana Traub, gh. nov.* Plantae hybridae species complures implicatae, magnitudine staturae variae, floribus magnitudine variis de tempore vernale prodictis. Holotype: Traub No. 515 (TRA), *H.* gh. *yeldiana* cl. 'Apricot' cult. La Jolla, Calif.

Hemerocallis gh. *stoutiana* Traub, *gh. nov.* Plantae hybridae species complures implicatae, magnitudine staturae variae, floribus magnitudine variis de tempors autumnale productis. Holotype: Traub No. 517 (TRA). *H.* gh. *stoutiana* cl. 'Miss Arcadia' cult. La Jolla, Calif.

Hymenocallis palmeri S. Wats. emend. Traub. Taxon 5: 195—196. 1956. Corrigenda:

page 196, first column, 2nd paragraph—
Lines 9 and 10, from bottom:
for "locate the holotype of *H. humilis* S. Wats.
"No. 555, Indian River, Fla., 1874, which"
read "locate the holotype of *H. humilis* S. Wats.,
"Palmer No. 555, Indian River, Fla., 1874, which"
Line 5 from bottom: for "S. Wats." read "Palmer".

REGISTRATION OF NEW AMARYLLID CLONES

Registrar: Mr. W. D. Morton, Jr.

This information is published to avoid duplication of names, and to provide a space for recording brief descriptions of new Amaryllid clones. Names should be as short as possible—one word is sufficient. It is suggested that in no case should more than two words be used. *The descriptions must be prepared in the form as shown in the entries below, and must be typewritten and double-spaced.* The descriptive terms used should be in harmony with those given in the "Descriptive Catalog of Hemerocallis Clones, 1893-1948" by Norton, Stuntz and Ballard. This may be obtained at $2.50 prepaid from: Dr. Thomas W. Whitaker, Executive Secretary, The American Plant Life Society, Box 150, La Jolla, Calif., U. S. A.

Correspondence regarding registration of all amaryllids such as *Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,* and so on, should be addressed to: Mr. W. D. Morton, Jr., Registrar, 3114 State Street Drive, New Orleans 25, Louisiana. The registration fee is $2.00 for each clone to be registered.

Registered amaryllid clone names take precedence over similar names published elsewhere without registration. This rule is retroactive.

A list of recognized registered clone names of amaryllids will be published in a later issue of HERBERTIA.

HYBRID **HYMENOCALLIS** CLONE

Introduced by Len Woelfle, Cincinnati, Ohio—

'Pax'—This new *Hymenocallis* (subgenus *Ismene)* hybrid is the originator's 1950 cross No. 5002, a seedling out of *Hymenocallis Amancaes* x *H. narcissiflora* , the reverse of the 'Sulphur Queen' cross. Parentage differs from that of 'Olympia' whose progenitors were 'Sulphur Queen' x *H. narcissiflora* .

Ismene 'Pax' [Fig. 21] differs from 'Sulphur Queen' in having a substantially white cup and tepals with yellow markings deep in the cup and at base of perianth segments, and having more strongly recurved lobes. Unlike 'Sulphur Queen' it shows no tendencies to develop crooked perianth tubes or imperfect blooms. Anthers of this clone also seem to develop more perfectly than in 'Sulphur Queen' and have an abundance of golden yellow pollen.

Except for being slightly smaller in all parts, and having more strongly recurved lobes, the bloom is not unlike that of 'Olympia'. The plant is robust in growth, attaining about the same dimensions as "Festalis" and "Olympia", which in my garden usually surpass the species and the other hybrids.

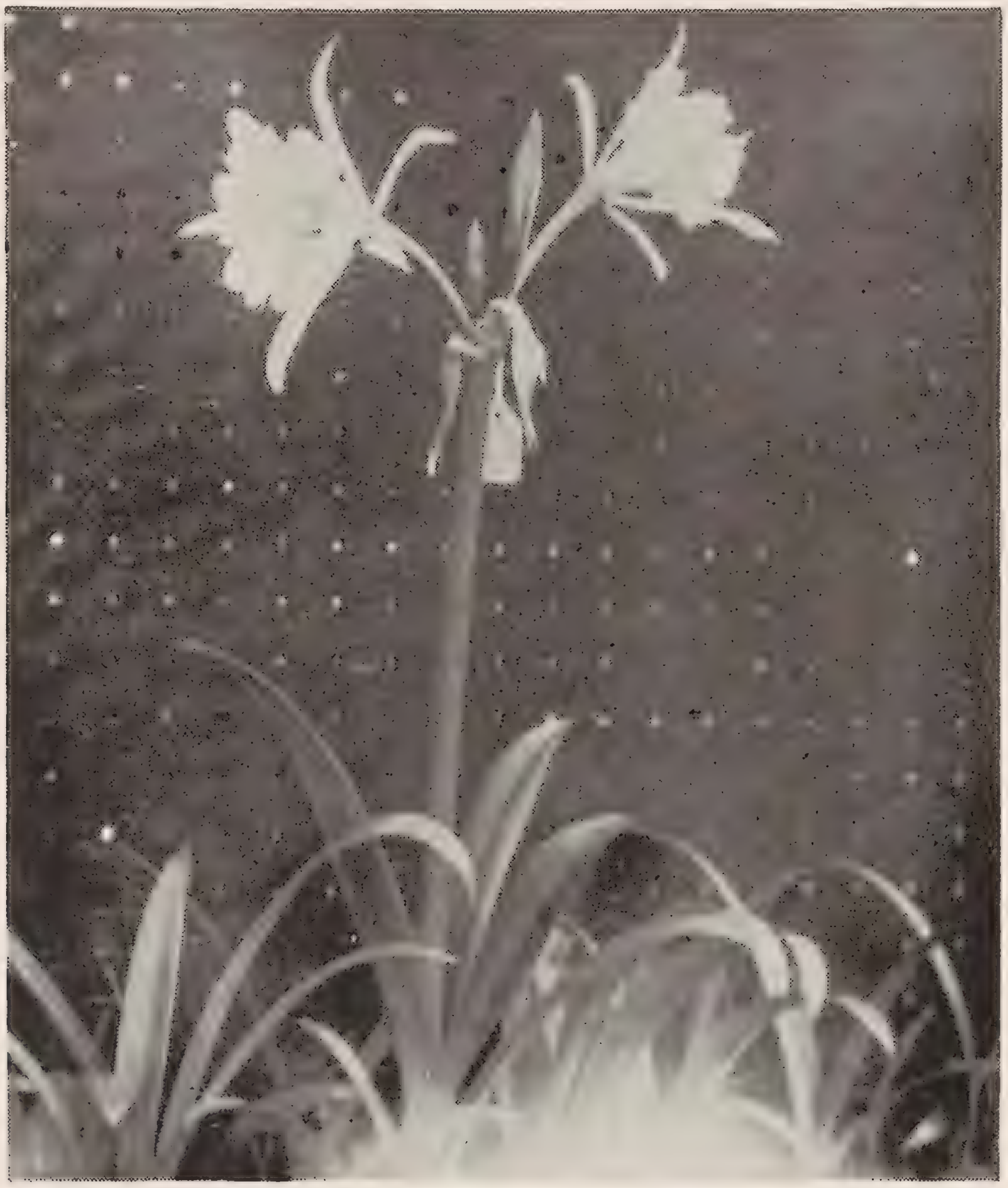


Fig. 21. *Hymenocallis* hybrid—clone 'Pax', as grown at Cincinnati, Ohio. Photo by Len Woelfle.

It flowers here consistently at about the same time as the 'Queen' and 'Olympia', about the middle of June, and should be an excellent intermediate addition to this group.

HYBRID **BRUNSVIGIA** CLONES

Introduced by L. S. Hannibal, Fair Oaks, Calif.—

The basis of segregation of the two hybrid types *(Brunsvigia rosea* and *Brunsvigia* x *multiflora)* is most readily made on the following features: A radial umbel, long pedicels and numerous flowers can be accepted as *B.* x *multiflora* characteristics, whereas less than twelve flowers in a compact umbel facing the sun is typically *B. rosea.*

'Blushing Sally': An attractive *Brunsvigia rosea* hybrid having some *B.* x *multiflora* blood. The plant has a large compact umbel bearing numerous large flesh pink flowers. The tepals are long, slender, and irregular reflexed giving the plant a jaunty air. As the flowers age the entire blossom takes on a deep bluish pink hue, thus the name.

'Grace': A seedling clone of *Brunsvigia rosea* which Frank Leach found in his garden about 1951 and named for Mrs. Grace R. Hannibal. The parent of this clone is unquestionably the 'Frank Leach' which was registered some years ago. 'Grace' has a compact umbel of nicely ruffled flowers bearing the first pictotee markings ever noted in *Brunsvigia* hybrids. It has been used widely as a pollinator on 'Hathor' and has led to many beautiful seedlings with similar markings.

'Blaze': A *Brunsvigia rosea* hybrid having a compact umbel of large vividly colored blossoms. The pedicels and tubes are extremely short whereas all tepals are very long and irregularly reflexed in a spiral pattern. The deep chrome throat or eye is readily visible and gives the effect of a yellow flame set off in a whirling blaze of rose red petals.

'Purity': A large showy snow white form of *Brunsvigia* x *multiflora alba* derived from selfing 'Hathor.' The tepals are very broad, well reflexed, particularly regular and very smooth in texture. The pedicels are four to five inches long and tend to radiate out equally from the umbel as spokes of a wheel. The size of the umbel, perfect symmetry of the individual flowers and their equal spacing makes this a plant which has no peers.

'Janice Gayle': This is a *Brunsvigia rosea* and 'Hathor' cross having ten or twelve widely flared blossoms on the scape. The tepals are quite slender, well reflexed with the tips colored a bright pink. The throat is short and colored a light yellow. The scape is quite slender. The open nature of the flowers with their long slender petals gives them a delicate airey appearance which is only rivaled by a *Sprekelia.* The plant has been named for Miss Janice Gayle Hannibal.

'Cream Pitcher': This is a cream white *B.* x *multiflora* seedling derived from Hathor'. The petals are relatively broad and attractively ruffled. Unlike most white Multifloras the throats of the blossoms are a deep butter yellow which carries up well into the limb and gives the petals a cream yellow shade. G. K. Cowlishaw mentioned some 20 years ago that a butter yellow blossom was one of his goals. If yellow in the Brunsvigia is like yellow in the Daffodil then a deep yellow blossom is a recessive seedling, and obviously yellow is not readily obtainable.

'Concord Lass': A large flowered *B.* x *multiflora* hybrid having slender, symmetrically pointed well reflexed petals of very smooth texture. The throat and tepals are snow white whereas the tips of the petals are faintly marked flesh pink. Such delicate coloring rarely occurs in hybrid Brunsvigias without appearing as washed out. In this instance the faint hues are clear and sharp, and are enhanced by the unruffled texture of the petals.

'Pacifica': This *Brunsvigia* x *multiflora* clone has been under observation for several years as the scape, pedicels and blossoms are massive compared to most of the hybrids. The well reflexed blossoms with their broad smooth petals are as large as a Diener Hybrid *Amaryllis* (Syn. *Hippeastrum)*. There is undoubtedly no plant known with such a perfect texture unless it be 'Purity'. No ruffle or surface irregularity mars the serenity of the tepals. The coloring of the limb is a pale flesh pink while the throat is white. No yellow eye is present. Each blossom is capable of lasting a week or more without wilting, even in hot weather. This permits the entire umbel to come in flower at one time.

AMARYLLID GENERA AND SPECIES

Harold N. Moldenke

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time so that these will be available to the readers.]

Amaryllis chilensis Ruiz et Pav., Fl. Peruv. et Chil. 3: 46-47. 1802.—Spathe usually 2-flowered, with the corolla campanulate, the nectary scales 3- or 4-fid, and the stamens declinate, the alternate ones shorter. The *Amaryllis chilensis* of L'Héritier, Sert. Ang. 11, described as having the spathe 1-flowered, sub-bifoliate, and lanceolate, the flowers pedunculate, and the leaves linear.

Root-fibers filiform; bulb subrotund, tunicate; scape 1 foot tall, erect, terete, hollow, purpurascent, shiny; leaves longer than the scape, many, linear, attenuate at both ends, compressed, obsoletely lineate, spongy-honeycombed within; spathe 2-flowered, rarely 1-flowered, diphyllous, the bracts linear-lanceolate, membranous, striate, rosy-white, longer than the peduncles; flowers pedunculate; corolla campanulate, 2 inches long, the tube short, yellow, the limb 5-parted, orange in color, the lobes lanceolate, spreading; nectary scales 6, inserted in the mouth of the tube, appressed to the stamens, 3- or 4-fid; filaments declinate, half as long as the corolla, the 3 alternate ones longer; anthers incumbent, assurgent; style declinate, longer than the stamens.

It grows in woods and fallow fields at Concepcion, Chile. It blooms in October and November. A vernacular name is "Hamancae encarnado."

Observation 1. The dried specimens and illustration of this species were lost in a memorable shipwreck. Observation 2. The Lilio-Narcissus monanthos, coccineus of Feuill. Obs. t. 3, p. 29. pl. 2-I is in reality a different species from the *Amaryllis chilensis* of L'Héritier, Sert. Ang. p. 11. Observation 3. The flowers exhibit no small similarity to those of *A. miniata, A. belladonna,* and *A. reginae.*

Amaryllis miniata Ruiz et Pav., Fl. Peruv. et Chil. 3: 57. 1802.—Spathe 2—4-flowered, corolla campanulate, flaring, the uppermost lobe reflexed, the lowest narrower, and the stamens and pistil decumbent. Root-fibers fasciculate, long, filiform, flexuous; bulb subrotund-ovate, large, tunicate, white, but when cut and exposed to the air turning to a vermillion color; scape solitary, central, often with 2 lateral ones from a single bulb, shorter than the leaves, erect-patulous, terete, obsoletely two-edged, hollow, scarcely purpurascent, very lightly whitish-pulverulent; leaves ensiform, glabrous, lineate on both surfaces, more shiny above, erect from the middle to the base, carinate, spreading and flat toward the apex, the apex itself deflexed; spathe purpurascent, 2—4-flowered, somewhat 2-edged, the bracts as many as the flowers, unequal, membranaceous, spreading, oblong-lanceolate, acute, marcescent, the interior ones gradually smaller; flowers pedunculate, nodding, large, showy; peduncles unequal, terete, curvate during anthesis, erect in the fruiting stage; corolla fleshy, vermillion, shiny, almost 3 inches long, longitudinally lineate-striate, its tube short, scarcely 6 mm. long, obtusely trigonous, 12-lined on the outside, green-spotted, green on the inside, the throat spreading, spotted with greenish-white little stars, the limb campanulate, 6-parted, the lobes spreading, lanceolate-oblong, equally long, the outermost ones broader, the upper one resupinate, and the 3 interior ones the lowest narrower; nectary scales 6, white, many-setose, inserted at the interestices at the bottom of the throat, of the corolla; filaments subulate, almost as long as the style, incurved at the apex, incumbent upon the base of the corolla segments, inserted at the base of the segments, alternating with the nectary scales, the 3 alternate ones shorter, greenish-white below, flesh-colored above, white at the apex; anthers large, white, yellow after the shedding of the pollen, incumbent, linear, tetragonal, 4-sulcate, 2-locular, emptying through lateral channels; ovary obovate, obtusely trigonous, triquetrous; style greenish-white beneath, red above, filiform, as long as the corolla, declinate with the stamens; stigma trigonous-trilobed; capsule obovate-oblong, trigonous, 3-locular, 3-valved, blackish in color; seeds many, black, imbricate. It grows abundantly in the wooded Andes, in ploughed places and in gardens at Chinchao, Macora, Machaynio, and Masapata. It blooms in July, August, and September—in the last-mentioned month progeny of plants brought alive from Peru have also blossomed in the botanical garden at Madrid. Vernacular name: lacre de montaña, because of the fact that this bulb, when cut and exposed to the air, quickly takes on the color of cinnabar (of Lacre, that is sealing-wax) in all its cuts; furthermore, the natives seal letters with the juice of this bulb, and finally the name of the flowers corresponds to their color (red).

Observation 1. It is related to *Amaryllis belladonna* L., from which it differs in having the bulb white, becoming red upon being cut and exposed to the air, the corolla rather flaring, glabrous at the base, the exterior segments broader, the uppermost resupinate, the lowest of the interior ones narrower, and in the other characters given in the description. Observation 2. We hope to publish a picture of this species in the Appendix.

Hemerocallis gh. *traubiana Moldenke, gh. nov.* Plantae hybridae species complures implicatae, magnitudine staturae variae, floribus magnitudine variis de tempore aestivo productis. Holotype: Traub No. 516 (TRA), *H.* gh. *traubiana* cl. 'Golden Triangle', cult. La Jolla, Calif.

HABRANTHUS IMMACULATUS SP. NOV.

Hamilton P. Traub and Katherine L. Clint

On an historic collecting expedition into Mexico in July 1954, the Clints, of Brownsville, Texas, brought back many amaryllids which have in some instances not yet been identified. One outstanding item, M-456, collected on July 11, 1954, in the State of Guanajuanto, several miles east of Celaya, on a gently sloping hillside, alt. 6450 ft., in the full sun, and in very porous clay loam, has proved to be new to science. It flowered for the junior author at Brownsville, Texas, in 1955 and again in 1956, and for the senior author at La Jolla, Calif., in late June and again in late September 1956. It was crossed with *Habranthus robustus* (from Argentina) and the progeny are thriving in the experimental plot. Our plant has been identified as one of the very finest *Habranthus* species, and has been approximately named *Habranthus immaculatus.* The large perigone is 7.7 cm. long, and 8 cm. across the face; it is pure white with a light greenish-yellowish throat, and is slightly fragrant.

It was assumed by some workers in the past that *Habranthus* species were confined to the southern hemisphere. This led to the hypothesis that *Habranthus andersonii* var. *texanus* (native to Texas) must have been introduced. Since *Habranthus immaculatus* from Mexico has been crossed with the South American *Habranthus robustus,* it appears that the members of the Subtribe *Zephyranthinae* of the Tribe *Zephyrantheae* (Traub, 1957) are closely related and have spread widely from a common ancestral stock. This is further reinforced by the crossing of the Mexican *Zephyranthes grandiflora* with the Argentinian *Habranthus juncifolius* (Traub, 1952).

Habranthus immaculatus Traub et Clint, **sp. nov.**

Herba bulbosa, bulbo tunicato; foliis 4 linearibus erectis 33—36 cm. longis, 1.5 cm. latis, glaucescentibus; scapo cavo 23.7 cm. alto; umbella uniflora; spatha 4.4 cm. longa, parte inferiori tubulosa; perigonio 7.7 cm. longo albo, tubo quam perigonio brevioribus; stigmate profunde trifido.

Description.—*Bulb* tunicated globose, relatively large. *Leaves* 4, upright, 33—36 cm. long, 1.5 cm. wide, linear, glaucescent, slightly twisted at the apex, appearing after the first flowers. *Scape* hollow, 23.7 cm. tall at anthesis, elongating to 30.4 cm. tall in fruit, reddish-glaucescent below, changing to dull glaucescent greenish above, flattish, 5.5 x 8 mm. at the base, 4 x 5 mm. at the apex. Umbel 1-flowered. *Spathe* 4.4 cm. long, united below, grayish-greenish, the bifid free segments pointed, opposite, 1.2 cm. long. *Pedicel* 4.2 cm. long at anthesis, elongating to 10 cm. in fruit. *Ovary* 8 mm. long, 3.8 mm. in diam, at the base, 4.8 mm. in diam. at the apex. *Perigone* held horizontally, 7.7 cm. long, 8 cm. across the face, slightly fragrant, pure white, light greenish-yellowish throat, lower portion of tepalsegs and tepaltube tinged greenish on outside. *Tepaltube* 9.5 mm. long, 5.5 mm. in diam. at the base, 9.1 mm. in diam. at the apex. *Tepalsegs* narrowly obovate, of four different sizes: top setepalseg 6.7 cm. long, 3.1 cm. wide, two side setepalsegs 6.7 cm. long, 2.8 cm. wide; two side petepalsegs 6.7 cm. long, 2.6 cm. wide, bottom petepalseg 6.7 cm. long, 2.5 cm. wide. *Stamens* of four different lengths, fascisculate, declinate-ascending, shorter than the style, filaments white; anthers semi-circular, pollen yellow. *Style* white, somewhat shorter than the tepalsegs, declinate-ascending, *stigma* deeply trifid, forks 5 mm. long. *Capsule* 1.9 cm. long, 2 cm. in diam. at the base, 2.2 cm. in diam. at the apex, triangular, lobes not prominent; *seeds* numerous per locule, D-shaped, flat, black, 11 mm. long, 6.5 mm. wide.

HOLOTYPE: Traub No. 540 (TRA), cult. La Jolla, Calif., 5-27-56; grown from bulb collected by Mr. & Mrs. Morris Clint several miles east of Celeya, State of Guanajuanto, Mexico, July 11, 1954, alt. 6450 ft.

NOTES.—This fine species sets seeds readily to self pollination and thus it will be possible to obtain wide distribution in a relatively short time.

See Figs. 2 and 3.

LITERATURE CITED

Traub, Hamilton P. Biosystematic experiments involving *Zephylanthes, Habranthus* and *Amaryllis.* Taxon 1: 121-123. 1952.

Traub, Hamilton P. Classification of the Amaryllidaceae—Subfamilies, Tribes and Genera. Plant Life vol. 13. 1957.

HABRANTHUS CARDENASIANA SP. NOV.

HAMILTON P. TRAUB and IRA S. NELSON

In 1954, the junior author discovered an unidentified species of *Habranthus* growing in fields recently cleared of deciduous jungle growth on the Hacienda Souce about 35 kilometers east-northeast of Santa Cruz, Bolivia. The soil was a deep black sandy loam. The owner of the land reported that it was near neutral in its pH reaction. The land is relatively flat but drainage is good. Rainfall is seasonal with distinct wet and dry seasons, and temperatures range from 5° to 43° C.; the altitude is approx. 445 meters above sea level. The blooming season in Bolivia ranged between Sept. 9 and 25 in 1954.

Bulbs of this species grown by the senior author bloomed in May and June in 1955 and 1956 and was identified as new to science. It has been named for Dr. Martin Cardenas of the University of Cochabamba, Bolivia, who kindly assisted the junior author in collecting amaryllids in Bolivia.

Habranthus cardenasiana Traub et Nelson, **sp. nov.**

Planta bulbosa, foliis pallide viridibus usque ad 22 cm. longis, 5.5—6.5 cm. latis, scapo 4.5—14.5 cm. alto, umbella uniflora, spatha 3—4.4 cm. longa, 1/4—1/3 supra basim tubulosa, floribus intus albis, extus usque ad 2/3 supra basim flavido-subviridibus, superiore 1/3 rubellis, tubo tepalorum 2—3 mm. longo, segmentis tepalorum 5.5—6.1 cm. longis 1.4—1.7 cm. latis, stylo usque ad medium segmentorum porrecto, stigmate profunde trifido, staminibus usque as 4 longitudines crescentibus, semper quam stylo brevioribus.

DESCRIPTION.—*Leaves* light green, glaucescent, linear, tapering slightly toward the base and the apex, up to 22 cm. long, 5.5—6.5 mm. wide. *Scape* 4.5—14.5 cm. tall, glaucescent. *Spathe,* pinkish to reddish, at anthesis, 3—4.4 cm. long, tubular for about 1/4 to 1/3 of its length below. *Pedicel* 3.6—5.6 cm. long, light green. *Ovary* 6.5—7.5 cm., 4 mm. in diam. *Flower* somewhat declined, *perigone* 5.7—6.3 cm. long, white inside, pinkish in upper 1/3 and yellowish-greenish below on outside. *Tepaltube* 2—3 mm. long. *Setsegs* oblanceolate, acute, up to 5.5—6.1 cm. long, top setseg 1.7 cm. wide, the two side setsegs 1.4 cm. wide. *Petsegs* narrowily oblanceolate, acute, two side petsegs 11 mm. wide, bottom petseg 9 mm. wide. *Style* about half as long as the tepalsegs, stigma deeply trifid, with filiform recurved forks. Stamens shorter than the style, disposed at four different lengths.

HOLOTYPE: Traub No. 542 (TRA), cult., La Jolla, Calif., 5-24-56, grown from bulbs collected by Ira S. Nelson 35 kilometers east-northeast of San Cruz, Bolivia in 1954.

NOTES.—This plant is of easy culture and should become a popular subject in gardens in the lower South, south Texas, southern Arizona, and California.

CHLIDANTHUS BOLIVIENSIS SP. NOV.

HAMILTON P. TRAUB and IRA S. NELSON

In 1953, Dr. Martin Cardenas, and his assistant, Miss Ann Marie Kruger, of Cochabama University, discovered a *Chlidanthus* species growing on the southern slope of the mountain immediately northwest of Cochabama, Bolivia. These bulbs were stored, and Dr. Cardenas gave the junior author some of them in 1954. In 1954, the junior author and Miss Kruger collected additional bulbs of this species in the place of original collection which is at an alt. of approx. 9,400 feet.

The bulbs grew on a southerly exposure of an extremely steep mountain side which was covered with grass. Low shrubs and terrestial bromeliads were sparsely scattered over the area which is apparently entirely above the tree-line. The soil is grayish-yellow and into which is incorporated decaying grass roots and leaves. A considerable amount of shale is mixed in the soil. The area has a semi-arid aspect. Rainfall in the area is light, and comes in a more or less definite season. Temperatures drop below freezing for short periods and occasional snows appear in winter. Clear skies and sunshine prevail most of the year.

For obvious reasons, this new species has been named appropriately *Chlidanthus boliviensis* [Fig. 22].

Bulbs of the *Chlidanthus* species were grown outdoors at La Jolla Calif., by the senior author and they flowered in late May and early

June in 1956. It was at once evident that they were quite distinct from *Chlidanthus fragrams* which was growing in quantity in the same area. Our plant differs from *C. fragrans* in having a much larger bulb with a much longer pseudo-neck, longer, wider, lighter green, concave leaves with lyaline margins minutely toothed; umbel 5—6—12-flowered; flowers always pedicellate, pedicels elongating to 1.8 cm. at anthesis; flowers opening in succession. It differs in other particulars as indicated in the following description.

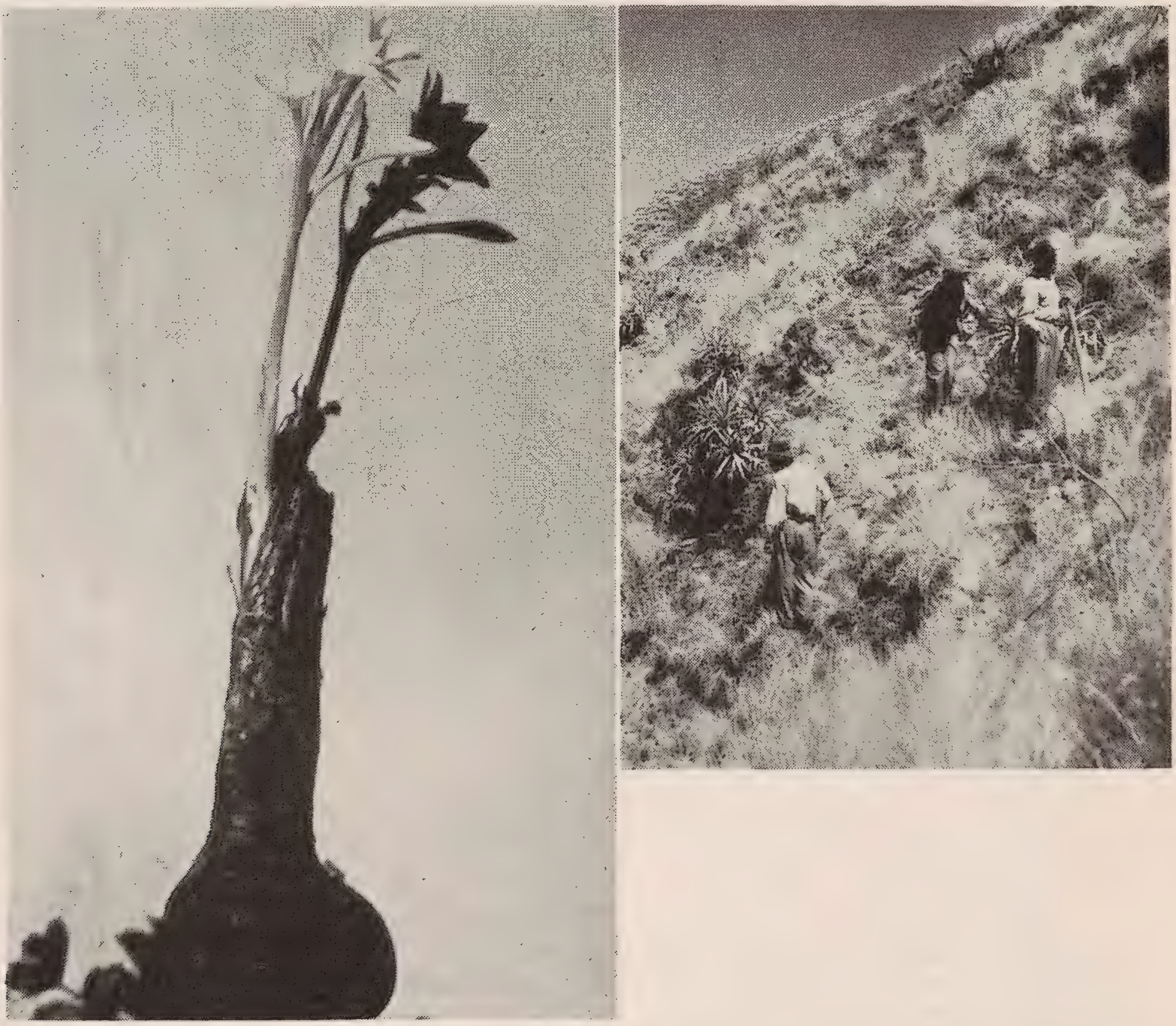


Fig. 22. *Chlidanthus boliviensis* Traub et Nelson, *sp. nov.* (left) as flowered by Dr. Cardenas at Cochabamba University in 1954 from dry bulbs in storage; umbel 5-flowered. Type location (left) on steep mountain side above tree line. Photos by Ira S. Nelson.

Chlidanthus boliviensis Traub et Nelson, **sp. nov.**

Planta bulbosa, bulbo maximo, pseudocollo 10 cm. longo 1.3—1.4 cm. diametro, foliis 9 vel 10 pallide, viridibus linearibus usque ad 63 cm. longis 1.5 cm. latis, ad apicem rotundatis, marginibus hyalinis minute denticulatis, scapo 23 cm. alto, umbella 5—6—12-flora, pedicellis usque ad 1.8 cm. longis, tubo tepalorum 6.7 cm. longo, perigonio lucide flavo, segmentis tepalorum 3.5 cm. longis, 1.1—1.3 cm. latis, filamentis subulatis 3—9 mm. longis ad basim segmentorum adnatis, stylo quam staminibus breviore, stigmate trifido.

DESCRIPTION.—*Bulb* very large, with pseudo-neck formed by interlacing of basal leaf-sheaths, 10 cm. long, 1.3—1.4 cm. in diam., brownish-reddish. *Leaves* 9—10, lettuce green (Wilson, 861), linear, up to 63 cm. long, up to 1.5 cm. wide in lower half, narrowing gradually to a rounded apex, concave, especially in lower part, margins hyaline, minutely toothed; starting at the time of flowering but not fully developed until later. *Scape* produced in the spring from the center of the bulb, solid, light green, flattish, without sharp edges, 23 cm. tall. 8 x 10.5 mm. diam. at the base, 6.5 x 9 mm. diam. at the apex, somewhat shorter when flowers first open, elongating as the others open. *Spathe-valves* 4, up to 6.5 cm. long, lanceolate; *bracteoles* smaller. *Umbel* 6-flowered; flowers opening in succession at intervals of 2 to 3 days. *Pedicels* at first short (below 1 cm. long) when in bud, but elongating up to 1.8 cm. long at anthesis; 3-sided. *Ovary* at anthesis 2.1 cm. long, 4.2 mm. in diam. at the base, 5.1 mm. in diam. at the apex; 3-sided. *Tepaltube* 6.7 cm. long, 4.3 mm. in diam. at the base, 7.3 mm. in diam. at the apex; 3-sided. *Perigone* bright yellow, fragrant, wide open at anthesis, 5.8 cm. in diam. at apex. *Setsegs* 3.5 cm. long, 1.1 cm. wide, ovate; *petsegs* 3.5 cm. long, 1.3 cm. wide, ovate. The free portions of the *stamens* arise from two levels at the base of the tepalsegs [Fig. 23]; the long flat lowermost portions of

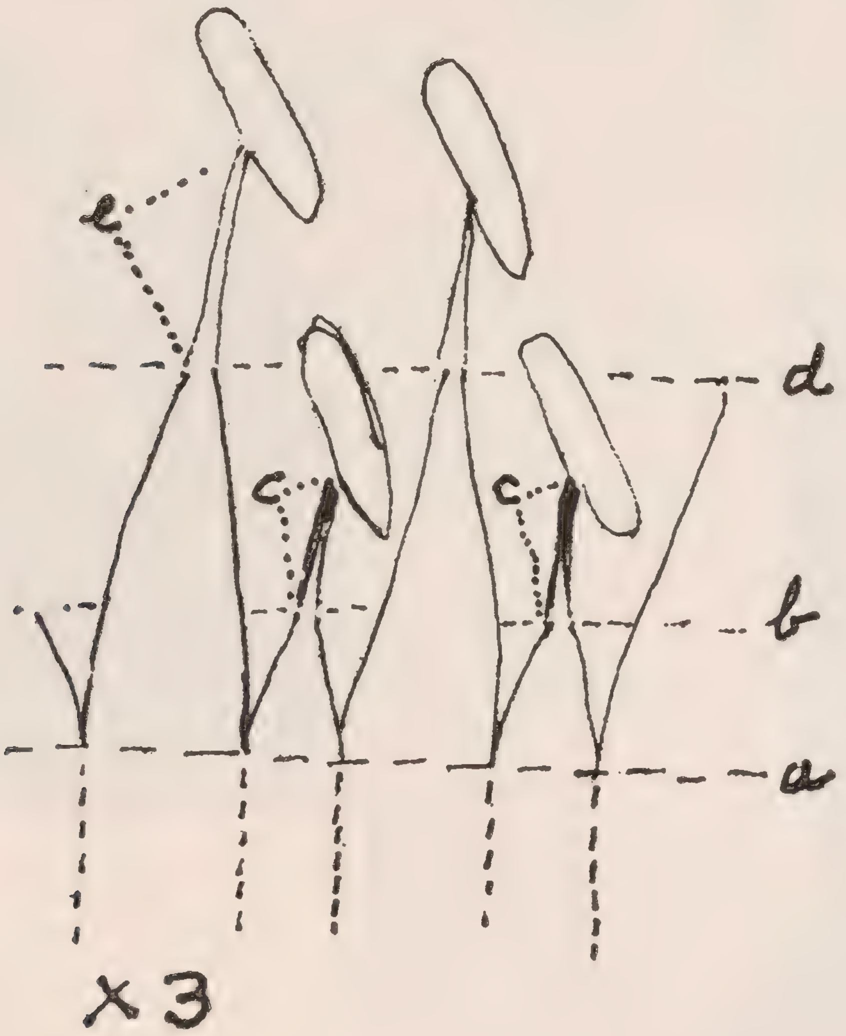


Fig. 23. *Chlidanthus boliviensis* Traub et Nelson, *sp. nov.* Stamens: a, apex of tepaltube; b, end of attachment of filament to setepalsegs, c, free portions of sepaline stamen-filaments; d, end of attachment of filaments to petepalsegs; e, free portions of petaline stamen-filaments. All enlarged three times.

the filaments are fused to the inside of the tepaltube up to the apex, and extend beyond as subulate portions fused to the bases of the tepalsegs; the subulate portions fused to the setsegs are 2 mm. wide at the base, 3 mm. long, those fused to the petsegs are 3.5 mm. wide at the base, 9 mm. long; thus the final free filiform portions of the *filaments* arise from two levels on the tepalsegs and alternate from 3 mm. long for the sepaline to 9 mm. long for the petaline filaments [Fig. 23]. *Anthers* are affixed about 1/3 up from the base, 6 mm. long at anthesis, cream yellow before anthesis, pollen yellow. *Style* somewhat longer than the longer stamens; *stigma* trifid.

HOLOTYPE: Traub No. 529a (TRA), cult. at La Jolla, Calif., 5-29-56; grown from bulb collected by Ira S. Nelson near Cochabamba, Bolivia in 1954.

NOTES.—With the new species available it will be possible to undertake breeding experiments by crossing with *Chlidanthus fragrans.* In this manner it may be possible to obtain greater variety in this genus.

GENUS **RAUHIA** AND **R. PERUVIANA, GEN. & SP. NOV.**

HAMILTON P. TRAUB, *La Jolla, California*

In 1954 and again in 1956, Prof. Dr. W. Rauh, and his colleague, Dr. Hirsch, of Heidelberg University, made scientific collecting expeditions to the Andes of Peru and Ecuador. Each time, among the material collected, the *Amaryllidaceae* were represented, and in particular, an undescribed amaryllid was discovered at Jaén in the Jaén-Bellavista valley of Peru. This plant, which has been appropriately named *Rauhia* for its discoverer, is the subject of this brief article.

Our plant is unique in a number of particulars. The bulb is very large, up to 20 cm. in diameter! The leaves are obovate, apex subacute; the scape is solid, up to 100—120 cm. tall, but the flowers are quite small, greenish-whitish. Although the other characters are outstanding, it is the flowers with which we are especially concerned. In our plant there is no staminal tube or cup, and the stamens are inserted inside the tepaltube 2/5 from the base; the free filiform filaments are in two groups, one of two shorter, and one of four longer, filaments. This is a unique condition in the *Amaryllidaceae.*

On the basis of gross morphology, our plant belongs in that portion of the subfamily *Amarylloideae* (Traub, 1957) which is composed of three tribes, as follows:

1a. Scape solid:

  2a. Seeds flat, winged or angled; (a) staminal cup absent with the subulate lower portions of the stamen-filaments attached to the base of the tepalsegs, or (b) staminal cup present and stamen-filaments attached to the rim or inside the staminal cup: *Chlidanthus, Pancratium, Stenomesson,* etc. ....Tribe 1. *Pancratieae*

  2b. Seeds fleshy; (a) tepaltube absent, staminal cup short, attached to the base of the tepalsegs, free stamen-filaments long, or (b) tepaltube present and with staminal cup present: *Hyline, Urceolina, Eucharis, Hymenocallis, etc.* ....Tribe 2. *Euchareae*

1b. Scape hollow:

Seeds flat, winged, tepaltube present, with (a) a circular outgrowth below the apex of the tepaltube, stamen-filaments dilated at the base, inserted at the mouth of the tepaltube, or (b) stamen-filaments free, filiform, or variously modified, or united at the base or at the apex: *Lepidopharynx, Phaedranassa, Callipsyche, Eustephia, Stricklandia, Eustephiopsis,* etc. ....Tripe 3. *Eustephieae*

In our plant the scape is solid, the seeds are flat, winged, and thus it belongs in the tribe *Pancratieae* according to the classification, but the tribal boundaries have to be modified in order to accommodate it as shown in the revised statement that follows (amplified portion in italics):

1a. Scape solid:

2a. Seeds flat, winged or angled; (a) staminal cup absent with subulate lower portion of stamen-filaments, in two series of 3, attached to the bases of the tepalsegs, *or, staminal cup absent with filiform stamen-filaments, two shorter than the other four, attached inside the tepaltube 3/5 from the base;* or (b) staminal cup present and stamen-filaments attached to the rim, or below it, inside the staminal cup: *Chlidanthus, Rauhia, Pancratium, Stenomesson,* etc.
Tribe 1. *Pancratieae*

With the relationship to the related genera established, the next step is to present a combined generic and specific description for the monotypic new genus and the type species in accordance with Article 41-1 of the International Code (Lanjouw, et al (ed.), 1956):

Genus *Rauhia* Traub, *gen. nov. (Amaryllidaceae)*
Rauhia peruviana Traub, *sp. nov.* (generic holotype)

DESCRIPTO GENERICO-SPECIFICA:—Plantae bulbosae, bulbo tunicato maximo 15—20 cm. diametro, foliis 2 obovatis as apicem subacutis 22 cm. longis, ad basim 9.5 cm. latis, scapo solido 100—120 cm. alto, spatha bivalva, valvis liberis, pedicellis usque ad 2.3 cm. longis, ovario 1.2 cm. longo, perigonio 3.8 cm. longo subviridi-albido, tubo tepalorum 2.2 cm. longo as basim 2 mm. diametro usque as 10 mm. ad apicem ampliato, segmentis tepalorum subaequalibus rectis ad apicem conniventibus, staminibus in tubo tepalorum 2/5 supra basim affixis, horum 2 segmenta subaequantibus, 4 a perigonio exsertis, stylo stamina longiora excedente, stigmate capitato, capsula per loculis dehiscente, seminibus numerosis oblongis alatis fusco-brunneis vel subnigris.

Holotype: Rauh No. 329 (= No. 535a + 535b, TRA), 10-25-56, Jaén, Peru.

COMBINED GENERIC AND SPECIFIC DESCRIPTION.—*Bulb* tunicated, globose, very large, up to 20.7 cm. long, up to 20 cm. in diam. *Leaves* 2, sheathing at the base, obovate, 22 cm. long, 9.5 cm. wide, narrowing to 7.5 cm. wide at the base, and to a subacute apex. *Scape* solid, appearing with the leaves, 100—120 cm. tall. *Spathe-valves* 2, broadly ovate, acuminate, 1.5 cm. at the base, 2.5 cm. long. *Umbel* many-flowered (17 or more). *Pedicels* up to 2.3 cm. long, 2 mm. in diam. *Ovary* 1.2 cm. long, deeply 3-lobed in lower part, 5 mm. in diam., round in upper part, 2 mm. in diam., ovules numerous in each locule. *Perigone* 3.8 cm. long, greenish-whitish, declined, of relatively thick substance. *Tepaltube* 2.2 cm. long, 3 mm. in diam. at the base, enlarging to 10 mm. in diam. at the apex. *Tepalsegs* continuous with the tepaltube and showing no demarcation, straight, slightly conniving at the apex, subsimilar, 1.6 cm. long, lanceolate; setepalsegs oblong, apex acutish, 6 mm. wide; petepalsegs 7 mm. wide, oblong, apex roundish. *Stamens* attached 2/5 from the base of the tepaltube, two 3.1 cm. long, subequaling the tepalsegs, four 3.6 cm. long and exserted from the perigone, anthers 7.5 mm. long, 2 mm. in diam., medianally affixed, versatile. *Style* overtopping the stamens, stigma capitate. *Fruit* a loculicidally dehiscing, deeply lobed capsule; seeds numerous in each locule, flat, oblong, winged, black or dark brown.

LITERATURE CITED

Lanjouw, J. et al (ed.) International Code of Botanical Nomenclature, Paris, 1954. Publ. 1956.

Traub, Hamilton P. Classification of the Amaryllidaceae—Subfamilies, Tribes and Genera. Plant Life 13. 1957.

LECTOTYPES OF LINNEAN GENERIC NAMES (AMARYLLIDACEAE)

To the International Code as adopted and revised at Amsterdam 1935, there appears a supplement, the proposal by A. S. Hitchcock and M. L. Green for "Species Lectotypicae Generum Linnaei" (Standard-Species of Linnean Generic Names: Phanerogamae). The names of *Amaryllidaceae* appearing in this list, based on Species Plantarum, ed. 1. 1753 and Genera Plantarum, ed. 5. 1754, have been adopted in connection with the present writer's manuscript on the taxonomy of this family. The selection of the lectotypes of these genera are hereby definitely confirmed and designated as follows: (1) *Allium* L. (lectotype): *A. sativum* L.; (2) *Amaryllis* L. (generic lectotype: *cf.* Herbert, Bot. Mag. sub pl. 2113. 1819; Append. Bot. Reg. 12. 1821; Amaryll. 144. 1837; Uphof, Herbertia 5: 109. 1938; Traub & Moldk., Amaryllidac.:Amaryll. p. 72. 1949; Amaryllis Manual, App. B. 1957): *Amaryllis belladonna* L. [species lectotype: Hermann pl. 194, Parad. Bat. 1698: *cf.* Traub & Moldk., Amaryllidac.:Amaryll. p. 38. 1949; Traub, Taxon 3: 102-111. 1954; Amaryllis Manual, App. B. 1957] (3) *Crinum* L. (lectotype): *C. americanum* L.; (4) *Galanthus* L. (lectotype): *G. nivalis* L.; (5) *Gethyllis* L. (lectotype): *G. afra* L.; (6) *Haemanthus* L. (lectotype): *H. coccineus* L.; (7) *Hemerocallis* L. (lectotype): *H. lilio-asphodelus* L. *cf.* W. J. Dress (Baileya 3: 107-108. 1955); (8) *Narcissus* L. (lectotype): *N. poeticus* L.; and (9) *Pancratium* L. (lectotype): *P. zeylanicum* L. ——*Hamilton P. Traub.*

CLASSIFICATION OF THE **AMARYLLIDACEAE**—SUBFAMILIES, TRIBES AND GENERA

HAMILTON P. TRAUB

In a recent paper, the enumeration of the genera and species of the *Amaryllidaceae* was reported (Traub, 1957a). In the present article, the classification of the *Amaryllidaceae* down to the generic level—subfamilies, tribes and genera—is reported. The classification is taken from the writer's manuscript on the taxonomy of the *Amaryllidaceae*—subfamilies, tribes, genera and species—which is now nearing completion and which will be published in the not too distant future.

BRIEF HISTORICAL REVIEW

Period 1763—1809. Only ten years after the appearance of Linnaeus' Species Plantarum (1753), Michel Adanson (1727-1806), who studied under Jussieu, published his version of a natural system of plant classification, including the *Amaryllidaceae* under the name, [family] *Narcissi* (Adanson, 1763). Bernard de Jussieu, of the Jardin des Plantes, Paris, never published his system, but his nephew, Antoine Laurent de Jussieu (1748-1636) revised and improved his uncle's system and published it (de Jussieu, 1789). He also included the *Amaryllidaceae* under the name, [family] *Narcissi.* The de Jussieu system of 1789 was later revised by another eminent French botanist, Jaume St.-Hilaire (1805). He included the *Amaryllidaceae* under the name [family] *Amarylleae* (see Table 1).

TABLE 1. *Amaryllidaceae* according to St.-Hiliare (1805)

I. Ovary superior	II. Ovary inferior	III. Allied genera
*Gethyllis L.**	*Haemanthus* L.	*Hypoxis* L.
Milla Cav.	*Amaryllis* L.	*Leptanthus* Mich.
Bulbocodium L.	*Pancratium* L.	*Heteranthera* Ruiz & Pav.
Hemerocallis L.	*Narcissus* L.	*Pontederia* L.
Crinum L.*	*Eustephia* Cav.	*Polianthes* L.
Agapanthus L'Hérit.	*Leucojum* L.	*Alstroemeria* L.
Tulbaghia L.	*Galanthus* L.	*Tacca* Rumph.

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* Error; ovary inferior; belongs in Division II.

These classifications were necessarily based wholly on gross morphological similarities which are still the basic criteria of the taxonomist today. Apparently in general the umbellate inflorescence, with some exceptions, together with the change from the superior to the inferior ovary within the family were considered as unifying principles. It should be noted that the general outlines of the most advanced classifications of today are foreshadowed in the conclusions reached by these keen-sighted pioneers—*Milla (Allieae), Tulbaghia* and *Agapanthus (Agapantheae), Hemerocallis (Hemerocalleae),* all in the superior-ovaried division of the family; *Amaryllis, Narcissus, Pancratium,* etc. *(Amarylloideae),* in the inferior-ovaried division. The third division, *Polianthes, Alstroemeria,* etc., is of course out of place as we know today, but this could only be cleared up later when information from various other scientific disciplines, including chromosome data, could be brought to bear.

Period, 1810—1932. The de Jussieu—St.-Hilaire classifications of the *Amaryllidaceae* were far ahead of their time, and they contrast markedly with those of Robert Brown (1810), Lindley (1830;1836), and their successors. Brown (1810) laid down the dictum that the amaryllids are to be confined to the inferior-ovaried section 2 of de Jussieu. This uninspired decapitation was accepted by Lindley (1830; 1836) who maintained that "The only orders with which this [the Amaryllidaceae] need be compared are *Liliaceae,* from which it is known by its inferior ovary . . ." In general, the lead of Lindley was followed by Bentham & Hooker (1883), Pax (1887); Pax & Hoffman, (1930) and Baker (1888). Thus progress was arrested until 1933, when almost simultaneously a number of workers shed new light on the subject.

Period 1933 to the present time. The inspired conclusions of Hutchinson (1934), based on gross morphological evidence, when published had already been reinforced in part by the chromosome data of McKelvey & Sax (1933) and Whitaker (1934), who showed conclusively that the Brownian dictum was artificial and untenable in some particulars. Thus new visitas were opened.

According to Hutchinson (1934) it is the capacity to produce the umbellate inflorescence—not the position of the ovary—which constitutes the main unifying principle in the apparent evolution of the *Amaryllidaceae.* Evolution is vertical from the superior to the inferior ovary within the family. McKelvey & Sax (1933) and Whitaker (1934) showed by chromosome evidence that the inferior ovaried Agave and its relatives (then grouped in the *Amaryllidaceae)* could no longer be separated from such a superior-ovaried genus as *Yucca* (then grouped in the *Liliaceae).* This enlarged group, including *Agave* and its relatives, as well as *Yucca,* was recognized as the family *Agavaceae* by Hutchinson (1934). (See also Traub 1953; Darlington & Wylie, 1956.)

Hutchinson (1934) also removed the related tribes—*Allieae, Agapantheae* and *Gilliesieae*—from the *Lilliaceae* and placed them in the *Amaryllidaceae* on the basis of the umbellate flowering habit, a characteristic condition in this family, and thus followed the precedent set by de Jussieu (1789) and St.-Hilaire (1805). This portion of Hutchinson's revision (Table 2) is apparently also supported by the chromosome data as summarized below (for complete data on the generic level, see the classification toward the end of this paper).

TABLE 2.

I. Ovary superior:	
Subfamily I. *Allioideae*	x=5, 6, 7, 8, 9, 10, 11, 12, 14, 15
Tribe 1. *Allieae*	x=5, 6, 7, 8, 9
Tribe 2. *Agapantheae*	x= 6 15
Tribe 3. *Gilliesieae*	x= 10(11)
Tribe 4. *Hemerocalleae*	x= 11, 12, 14
II. Ovary inferior:	
Subfamily II. *Ixiolirioideae*	x= 12
Subfamily III. *Amarylloideae*	x= 6, 7, 8, 9, 10, 11, 12, 14, 15, 23

Since the ancestral stock from which the *Amaryllidaceae* originated was liliaceous, it is to be expected that among the superior-ovaried part, the subfamily *Allioideae,* which is the closest to the *Liliaceae,* the basic x=5 has been retained to a limited extent, and that this basic number is not found in the more advanced inferior-ovaried part, the subfamily *Amarylloideae.* Darlington & Wylie (1956) therefore are apparently in error in retaining the two tribes, *Allieae,* x=5, 6, 7, 8, 9 and *Agapantheae,* x=6, 15, in the *Liliaceae,* while leaving the related tribe *Gilliesieae,* x=10(11), and the tribe *Hemerocalleae,* x=11, 12, 14, in the *Amaryllidaceae.* This amounts to an horizontal decapitation that ignores the morphological similarities as well as the chromosome data and thus severs the root base of the evolutionary line. It is clear that the four tribes—*Allieae, Agapantheae, Gilliesieae* and *Hemerocalleae*—all belong in the *Amaryllidaceae* on the basis of the gross morphology and the chromosome data.

CLASSIFICATION OF THE SUBFAMILIES, TRIBES AND GENERA

When Hutchinson (1934) presented his new classification of the monototyledons, he expressed the thought that it was up to taxonomic workers to take various portions under their wing and work them out in detail down to the tribal, generic and species levels. The writer, who had been working on the taxonomy of the amaryllids for many years, and who immediately recognized the excellence of Dr. Hutchinson's work, took up the challenge for the monograph of the *Amaryllidaceae.* Thus the classification presented here follows in general the delimination of the family by Hutchinson (1934) with necessary changes required on the basis of research since 1934.

Changes since 1934. On the basis of work by Whitaker (1934) and Granick

(1944), the genus *Hosta* has been removed from the tribe *Hemerocalleae* and transferred to the family *Agavaceae* (Traub, 1953; Darlington & Wylie, 1956). The residual tribe *Hemerocalleae* has been removed from the *Liliaceae* and placed in the *Amaryllidaceae* on the basis of morphological and chromosome similarities (Traub, 1938; Traub & Moldenke, 1949); this conclusion was confirmed by Darlington & Wylie (1956).

Within the family, since 1949, it has been necessary to change the name of one tribe and to increase the number of tribes from 14 to 15 in order to accommodate the diversities encountered. In a number of instances it has been necessary to shift genera from one tribe to another.

Revisions by various workers. The pre-Hutchinsonian classifications of the *Amaryllidaceae,* beginning with Robert Brown (1810) include no members with superior ovaries. This earlier work is not reviewed in the present paper.

Traub (1938) presented a classification of the tribes of *Amaryllidaceae* following the Hutchinson (1934) system. This was revised by Traub & Moldenke (1949). The present is a third revision, but differs from the foregoing in bringing the grouping down to the subtribal and generic levels. Its objective is to correlate the present knowledge concerning the probable relationships within the family.

A number of single genera and parts of genera have been revised by various workers since 1934, but these do not come within the scope of the present paper. Only revisions of groups of related genera or tribes, or parts of tribes or subtribes consisting of more than one genus are therefore included. The pertinent work since 1934 is briefly summarized, and credit to the workers is hereby gratefully acknowledged.

In the tribe *Allieae,* Hoover (1939;1940;1941;1955) has worked out the relationships between *Brodiaea, Dichelostemma, Triteleia* and *Triteleiopsis* (the major part of the subtribe *Brodiaeinae),* and Ingram (1953) revised the genera *Bloomeria* and *Muilla* in the same subtribe. Moore (1955) detailed the relationships between *Dandya, Bessera, Petronymphe,* and *Milla,* representing the subtribe *Millinae.*

Hutchinson (1939) monographed the tribe *Gilliesieae.* Traub [1942(1943)] revised the tribe *Ixiolirieae.* Traub (1952;1956) showed that *Rhodophiala* and *Phycella* do not belong in the tribe *Amarylleae* (as synonyms of *Amaryllis* L.) as maintained by Baker (1888), but that *Rhodophiala* belongs in the tribe *Zephyrantheae* on the basis of breeding experiments, and chromosome data; and that *Phycella* belongs in the tribe *Eustephieae* for the reasons stated by Stapf (1929).

Traub & Moldenke (1949) revised the tribe *Amarylleae.* Fernandes (1945) by means of chromosome studies worked out the relationship between two members of the tribe *Narcisseae (Narcissus* and *Tapeinanthus).* Traub & Moldenke (1947) monographed the tribe *Galantheae (Galanthus, Leucojum,* and *Lapiedra);* and Stern (1956) revised the genera *Galanthus* and *Leucojum* of the same tribe.

Although progress has been made, it is apparent that much critical work remains to be accomplished in the future.

In the following revised classification, all of the recognized genera are accounted for; the list of synonyms has been published elsewhere (Traub, 1957a).

Chromosome data and other criteria. To the classification here presented, the available chromosome data, from summaries (Flory, 1944; Darlington & Wylie, 1956; Traub, 1957b), have been added *to test* the hypothesis (which such a classification really is) as far as possible with such data. It is realized that evolution due to *gene mutations* on the chromosome chain is of even more fundamental significance than the recital of chromosome *numbers.* The gross morphological data, the phenotypic picture, which represent the expression of the genus under the given environmental conditions, will ever remain the chief measure which the taxonomist has of gene action. When they can be obtained, the marshaling of data from still other disciplines such as embryology, behavior of chromosomes during meiotic division, physiology, bio-chemistry, histology, breeding experiments, and so on, are helpful in arriving at a decision in complicated cases.

Number of genera and species. In a recent statistical enumeration of the *Amaryllidaceae* (Traub, 1957a), 97 genera and 1522 species were recognized for the family. Since publication *Caloscordum* has been reduced to the synonymy of *Allium.* After critical studies have been made in some instances, the number of genera and species will probably be reduced somewhat—possibly by less than five percent.

Further revisions. Suggestions from other workers concerning any errors of commission and omission are welcomed. With the necessary qualifications indicated above, the classification is put forward subject to further revision as may appear desirable on the basis of further research.

Symbols. The letter "x" refers to the basic chromosome number from which apparently various multiples have been built up, 2x, 4x, 8x, etc. (See Darlington & Wylie, 1956; Traub, 1957b.)

Use of classification. It has found immediate use in arranging the specimens in the Traub Herbarium by tribes and genera. Collectors of living plants may use it in choosing additions for their collections. It shows up the gaps in the chromosome atlas of this family which should be filled in by research workers.

I. CLASSIFICATION OF THE AMARYLLIDACEAE—SUBFAMILIES AND TRIBES

1a. Ovary superior (33 genera; 711 species) ....SUBFAMILY I. ALLIOIDEAE
x=5, 6, 7, 8, 9, 10, 11, 12, 14, 15

2a. Inflorescense umbellate:

3a. Flowers actionomorphic:

4a. Rootstock a corm or bulb (19 genera; 663 species) ....Tribe 1. ALLIEAE
x=5, 6, 7, 8, 9

4b. Rootstock rhizomatous (2 genera; 34 species) ....Tribe 2. AGAPANTHEAE
x=6, 15

3b. Inflorescence usually zygomorphic (9 genera; 14 spp.) ....Tribe 3. GILLIESIEAE
x=10, (11)

2a. Infloresence a raceme, a bostryx to subumbellate, or terminal solitary flowers on scapes (3 genera; 17 spp.) ....Tribe 4. HEMEROCALLEAE
x=11, 12, 14

1b. Ovary inferior:

5a. Scape leafy in lower part (2 genera; 3 spp.) ....SUBFAMILY II. IXIOLIRIOIDEAE
x=12

Inflorescence subumbellate (2 genera; 3 spp.) ....Tribe 5. IXIOLIRIEAE
x=12

5b. Scape not leafy; inflorescence umbellate: (63 genera; 809 spp.) ....SUBFAMILY III. AMARYLLOIDEAE
x=6, 7, 8, 9, 10, 11, 12, 14, 15, 23

6a. Parandroecium (modified filaments) usually absent, if present, then not conspicuous:

7a. Anthers schistandrous:

8a. Fruit not baccate, except in *Gethyllis* (in *Zephyrantheae):*

9a. Bulb coat not held together by minute fibers when broken:

10a. Paraperigone, if present, usually inconspicuous, except in *Placea* (in *Amarylleae):*

11a. Spathe united into a tube for part of its length below, except in *Rhodophiala* (8 genera; 160 spp.)..Tribe 6. ZEPHYRANTHEAE
x=6, 7, 9, 11, 12

11b. Spathe valves free (see also *Rhodophiala under 11a, above:*

12a. Tepaltube not enlarging markedly toward the apex, tepalsegs longer than the tepaltube (6 genera; 80 spp.) ....Tribe 7. AMARYLLEAE $x=6, 7, 8, 9, 11, 15$

12b. Tepaltube usually enlarging markedly toward the apex, tepalsegs usually shorter than the tepaltube (5 genera; 52 spp.) ....Tribe 8. CYRTANTHEAE $x=8, 11$

10b. Paraperigone present, and usually conspicuous (2 genera; 23 spp.) ....Tribe 9. NARCISSEAE $x=7, 10, 11, 15$

9b. Bulb coat held together by minute fibers when broken (9 genera; 208 spp.) ....Tribe 10. CRINEAE $x=11, 12$

8b. Fruit baccate (4 genera; 88 spp.) ....Tribe 11. HAEMANTHEAE $x=7, 8, 9, 11$

7b. Anthers porandrous (3 genera; 32 spp.)....Tribe 12. GALANTHEAE $x=7, 8, 9, 11, 12$

6a. Parandroecium (modified filaments) usually present, often as a conspicuous cup:

13a. Scape solid:

14a. Seeds flat, winged, or angled, hard (7 genera; 48 spp.) ....Tribe 13. PANCRATIEAE $x=11, 13$

14b. Seeds fleshy, oval or angular (9 genera; 73 spp.) ....Tribe 14. EUCHAREAE $x=12, 23$

13b. Scape hollow (10 genera; 23 spp.) ....Tribe 15. EUSTEPHIEAE $x=23$

II. GROUPING OF GENERA UNDER SUBTRIBES, TRIBES AND SUBFAMILIES

Subfamily 1. ALLIOIDEAE (711 spp.) $x=5, 6, 7, 8, 9, 10, 11, 12, 14, 15$
Tribe 1. ALLIEAE (663 supp.) $x=5, 6, 7, 8, 9$
Subtribe 1. ALLIINAE $x=6, 7, 8, 9$ (598 spp.)
1. ALLIUM (550 spp.) $x=7, 8, 9$
2. NOTHOSCORDUM (17 spp.) $x=8, 9$
3. STEINMANNIA (1 sp.) $x=?$
4. IPHEION (24 spp.) $x=6$
5. TRISTAGMA (7 spp.) $x=?$
6. LEUCOCORYNE (14 spp.) $x=?$
7. LATACE (1 sp.) $x=?$

Subtribe 2. BRODIAEINAE $x=5, 6, 7, 8, 9$ (40 spp.)
8. MUILLA (4 spp.) $x=?$
9. ANDROSTEPHIUM (2 spp.) $x=?$
10. TRITELEIOPSIS (1 sp.) $x=?$
11. TRITELEIA (15 spp.) $x=5, 7, 8$
12. BLOOMERIA (2 spp.) $x=?$
13. BRODIAEA (10 spp.) $x=5, 6, 7, 8$
14. DICHELOSTEMMA (6 spp.) $x=9$

Subtribe 3. MILLINAE (11 spp.) $x=?$
15. DANDYA (1 sp.) $x=?$
16. BESSERA (2 spp.) $x=?$
17. PETRONYMPHE (1 sp.) $x=?$
18. MILLA (6 spp.) $x=?$
19. DIPHALANGIUM (?) (1 sp.) $x=?$

Tribe 2. AGAPANTHEAE (34 spp.) $x=6, 15$
20. TULBAGHIA (25 spp.) $x=6$
21. AGAPANTHUS (9 spp.) $x=15$

Tribe 3. GILLIESIEAE (14 spp.) x=10, (11)
- 22. SPEEA (1 sp.) x=?
- 23. SCHICKENDANTZIELLA (1 sp.) x=?
- 24. TRICHLORA (1 sp.) x=?
- 25. ERINNA (1 sp.) x=?
- 26. SOLARIA (2 spp.) x=?
- 27. MIERSIA (2 spp.) x=10, (11)
- 28. GETHYUM (1 sp.) x=?
- 29. GILLIESIA (4 spp.) x=?
- 30. ANCRUMIA (1 sp.) x=?

Tribe 4. HEMEROCALLEAE (17 spp.) x=11, 12, 14
- 31. HEMEROCALLIS (15 spp.) x=11
- 32. HESPEROCALLIS (1 sp.) x=12
- 33. LEUCOCRINUM (1 sp.) x=14

Subfamily 2. IXIOLIRIOIDEAE (3 spp.) x=12

Tribe 5. IXIOLIRIEAE (3 spp.) x=12
- 34. IXIOLIRION (1 sp.) x=12
- 35. KOLPAKOWSKIA (2 spp.) x=?

Subfamily 3. AMARYLLOIDEAE (809 spp.) x=6, 7, 8, 9, 10, 11, 12, 14, 15, 23

Tribe 6. ZEPHYRANTHEAE (160 spp.) x=6, 7, 9, 11, 12

Subtribe 1. ZEPHYRANTHINAE (125 spp.) x=6, 7, 9
- 36. ZEPHYRANTHES (74 spp.) x=6, 7
- 37. HABRANTHUS (19 spp.) x=6
- 38. SPREKELIA (1 sp.) x=?
- 39. RHODOPHIALA (31 spp.) x=9

Subtribe 2. STERNBERGINAE (35 spp.) x=11, 12
- 40. STERNBERGIA (7 spp.) x=11, 12
- 41. APODOLIRION (6 spp.) x=?
- 42. GETHYLLIS (21 spp.) x=?
- 43. KLINGIA (1 sp.) x=?

Tribe 7. AMARYLLEAE (80 spp.) x=6, 7, 8, 9, 11, 12, 15

Subtribe 1. LYCORINAE (27 spp.) x=6, 7, 8, 9, 11, 12, 15
- 44. LYCORIS (15 spp.) x=6, 7, 8, 9, 11, 15
- 45. UNGERNIA (8 spp.) x=12
- 46. GRIFFINIA (4 spp.) x=?

Subtribe 2. AMARYLLINAE (53 spp.) x=11
- 47. WORSLEYA (1 sp.) x=?
- 48. AMARYLLIS (46 spp.) x=11
- 49. PLACEA (6 spp.) x=?

Tribe 8. CYRTANTHEAE (52 spp.) x=8, 11
- 50. HANNONIA (1 sp.) x=?
- 51. ANOIGANTHUS (5 spp.) x=8
- 52. VALLOTA (1 sp.) x=8
- 53. MOLDENKEA (1 sp.) x=?
- 54. CYRTANTHUS (44 spp.) x=8, 11

Tribe 9. NARCISSEAE (23 spp.) x=7, 10, 11, 15
- 55. NARCISSUS (22 spp.) x=7, 10, 11
- 56. TAPEINANTHUS (1 sp.) x=(7), 15

Tribe 10. CRINEAE (231 spp.) x=11, 12

Subtribe 1. CRININAE (208 spp.) x=11, 12
- 57. CRINUM (148 spp.) x=11
- 58. BRUNSVIGIA (16 spp.) x=11
- 58a. xCRINODONNA (1 sp.) x=?
- 59. BOOPHONE (2 spp.) x=11
- 60. NERINE (35 spp.) x=11, 12
- 61. AMMOCHARIS (5 spp.) x=11
- 62. CYBISTETES (1 sp.) x=?

Subtribe 2. STRUMARIINAE (23 spp.) x=?
63. HESSEA (15 spp.) x=?
64. CARPOLYZA (1 sp.) x=?
65. STRUMARIA (7 spp.) x=?
Tribe 11. HAEMANTHEAE (88 spp.) x=7, 8, 9, 11
66. HAEMANTHUS (77 spp.) x=8, 9
67. CLIVIA (5 spp.) x=11
68. CHOANANTHUS (2 spp.) x=?
69. CRYPTOSTEPHANUS (5 spp.) x=(7), 11
Tribe 12. GALANTHEAE (32 spp.) x=7, 8, 9, 11, 12
70. LEUCOJUM (11 spp.) x=7, 8, 9, 11
71. LAPIEDRA (2 spp.) x=11
72. GALANTHUS (10 spp.) x=12
Tribe 13. PANCRATIEAE (48 spp.) x=11, 23
73. CHLIDANTHUS (3 spp.) x=?
74. RAUHIA (1 sp.) x=?
75. VAGARIA (1 sp.) x=?
76. PANCRATIUM (20 spp.) x=11
77. PARAMONGAIA (1 sp.) x=?
78. PAMIANTHE (1 sp.) x=23
79. STENOMESSON (21 spp.) x=?
Tribe 14. EUCHAREAE (73 spp.) x=12, 23
80. HYLINE (2 spp.) x=?
81. URCEOLINA (3 spp.) x=?
82. EUCHARIS (21 spp.) x=?
83. PLAGIOLIRION (1 sp.) x=?
84. CALLIPHRURIA (2 sp.) x=?
85. HYMENOCALLIS (36 spp.) x=12, 23
86. ELISENA (3 spp.) x=23
87. CALOSTEMMA (3 spp.) x=?
88. EURYCLES (2 spp.) x=?
Tribe 15. EUSTEPHIEAE (23 spp.) x=23
Subtribe 1. LEPIDOPHARYNGINAE (1 sp.) x=?
89. LEPIDOPHARYNX (1 sp.) x=?
Subtribe 2. EUSTEPHIINAE (22 spp.) x=23
90. PHAEDRANASSA (5 spp.) x=23
91. CASTELLANOA (1 sp.) x=?
92. CALLIPSYCHE (3 spp.) x=?
93. PHYCELLA (7 spp.) x=?
94. EUSTEPHIA (2 spp.) x=?
95. HIERONYMIELLA (1 sp.) x=?
96. STRICKLANDIA (1 sp.) x=?
97. EUCROSIA (1 sp.) x=?
98. EUSTEPHIOPSIS (2 spp.) x=?

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[COLLECTING AMARYLLIDS—Clint, continued from page 22.]

color and appearance to *Habranthus robustus.* The flowers were quite large, 2 inches across the face and 2¼ to 2½ inches long, with a very short tepaltube and a long, declined, deeply trifid style. They were set at an angle on a long pedicel and were borne on an 18-20 inch, robust scape from leafless bulbs. The white flower was no doubt the one I had seen the year before just south of Jacala. We have assigned the number M-565-A to this form. The pink flowered form [M-445 & M-565] was none other than the bulbs we had twice collected in leaf at Puerto de la Zorra! The two are similar in form, if not in color, except that M-565-A has glaucous leaves and larger bulbs and seed capsules. Further study will reveal whether the bulbs are distinct from one another or whether they are but forms of the same species. Strangely, these mountainous and shade loving bulbs seem closely allied to the two desert plateau bulbs: *Z. concolor* and *Habranthus immaculatus* [M-456].

[To be concluded in 1958 Herbertia.]

[PLANT LIFE LIBRARY—continued on page 83.]

its present distribution. A most stimulating book for the student of phytogeography. Highly recommended.

BIOLOGY OF ROOT-INFECTION FUNGI, by S. D. Garrett. Cambridge Univ. Press, 32 E. 57th St., New York 22, N. Y. 1956. Pp. 293. $5.50. This important book on the nature of root-infecting fungi and their control is based largely on intensive researches carried on during the past quarter century. This book fills a definite need and is highly recommended.

BACTERIAL ANATOMY, edited by E. T. C. Spooner and B. A. D. Stocker. Cambridge Univ. Press, 32 E. 57th St., New York 22, N. Y. 1956. Pp. 360. Illus. $6.00. The fifteen articles in this book were presented as papers at the 6th Symposium of the Society for General Biology in London, April 1956. The researches show that the description of the bacterial cell is gradually being put on a factual basis by means of the newest research tools. This stimulating book is highly recommended to zoologists, botanists and others interested in the relationship between bacteria and other living things.

MODERN ASPECTS OF pH, by James Small. D. Van Nostrand, 250 5th Av., New York. 1954. Pp. 247. The new pH as presented in this important book is "based upon an empirical standard as a result of the official recognition that what is being measured is not the concentration but the *activity* of hydrogen ions in relation to activity of other associated ions. The book is written with "special reference to plants and soils. It is highly recommended.

SOIL, by G. V. Jacks. Philosophical Library, 15 E. 40th St., New York. 1954. Pp. 221. Illus. $5.00. The purpose of this clearly and concisely written book is to give the farmer, the student of agriculture and others an insight into the new science of soil management. Highly recommended.

PLANT PHYSIOLOGY, 4th ed. revised, by M. Thomas, S. L. Ranson and J. A. Richardson. Philosophical Library, 15 E. 40th St., New York 16, N. Y. 1956. Pp. 692. Illus. $12.00. This revised 4th edition of a standard text on Plant Physiology is written for the advanced student of botany, and students in chemistry, physics, agriculture, and other subjects. The text is grouped into parts as follows: I. protoplasm; II. the absorption, translocation and elimination of water, solutes and gases; III. nutrition and metabolism; IV. growth and movement. Highly recommended.

NEW CONCEPTS IN FLOWERING-PLANT TAXONOMY, by J. Heslop-Harrison. Harvard Univ. Press, Cambridge, Mass. 1956. Pp. 135. Illus. $1.25. The author considers the recent progress in taxonomy as due to the experimental study of evolution which serves as the factual basis for classification, particularly on the species level. After a concise discussion of the development of taxonomy, the rest of the book is devoted to the nature of variability, breeding systems, cytology (caryology) in relation to taxonomy, and experimental categories. The author places special emphasis on the study of living natural populations or adequate samples of these, rather than on isolated, usually dead specimens. A must for all taxonomists.

THE PRINCE OF BOTANISTS—CARL LINNAEUS, by Nora Gourlie. H. F. & G. Witherby, 5 Warwick Court, London W. C. 1. 1953. Pp. 291. Illus. 30/- net. This is a most charming biography of the great Linnaeus which is based on extensive research. It is just the kind of book about Linnaeus for which the readers have been waiting. Highly recommended to all members.

PLANT TAXONOMY, by E. L. Core. Prentice-Hall, Inc., 70 5th Av., New York 11, N. Y. 1955. Pp. 459. Illus. $7.50. In part one of this important new book the principles of taxonomy are discussed more or less in the order in which they were formulated. The rest of the book is devoted to an account of the main families of vascular plants. This stimulating book by an eminent authority on the subject is highly recommended.

THE HARDINESS OF PLANTS, by J. Levitt. Academic Press, 111 5th Av., New York 3, N. Y. 1956. Pp. 278. Illus. $7.00. The purpose of this book is to summarize the known facts on hardiness, and to stimulate further research. It is intended for the student in plant physiology, and also for workers in agronomy and horticulture. The material is grouped into three sections—low temperature hardiness, low moisture or drought hardiness, and high temperature hardiness. Highly recommended.

ORGANIC INSECTICIDES: THEIR CHEMISTRY AND MODE OF ACTION, by R. L. Metcalf. Interscience Pub. Inc. 250 5th Av., New York 1, N. Y. 1955. Pp. 392. Illus. $8.50. The purpose of this book is to summarize most of the available information on the chemistry and mode of action of insecticides, the relation of their chemical structure to toxicity, their metabolism in plants and animals. and their toxic hazards to higher animals. The book is written for the student and investigator in the hope that it will stimulate the logical and orderly growth of insect toxicology. Highly recommended.

A PRACTICAL MANUAL OF MEDICAL AND BIOLOGICAL STAINING TECHNIQUES, by E. Gurr. 2nd ed. Interscience Publ. Inc., 250 5th Av., New York 1, N. Y. 1956. Pp. 451. Illus. $6.50. This revised edition of the author's earlier work contains much new material, and fills the need for a practical manual dealing with most branches of microscopic staining, entirely divorced from theory and general statements. The sections include general methods, animal histology, botanical methods, cytological methods, fluorescence microscopy, histological methods and smear preparations. Highly recommended.

[PLANT LIFE LIBRARY—continued on page 100.]

3. GENETICS AND BREEDING

SECOND REPORT ON LYCORIS X WOODII

Hamilton P. Traub and Harold N. Moldenke

This is a *Lycoris traubii* Hayward ♀ x *L. radiata* (L'Hérit.) Herb. ♂ cross. The early history of this cross appeared in Traub & Moldenke's "Amaryllidaceae: Tribe Amarylleae" (1949), page 182. The cross was made by Wm. T. Wood, of Macon, Georgia. The seeds had been received by the senior writer in 1941 as "*L. aurea* x *L. radiata*" since at that time what is now recognized as *L. traubii* was still included with *L. aurea* (L'Hérit.) Herb. The seed parent used by Mr. Wood is pictured in Fig. 13, which shows a specimen of *L. traubii.* Thus the correction has to be made. The seedlings were grown under pot culture at Beltsville, Maryland, from 1945 to 1951 when one of them flowered on May 31, 1951. The bulbs were dried off in 1952 and transferred to Arcadia, California, where they were planted outdoors in February 1953. Another moving was necessary due to smog-polluted air in the Los Angeles basin, and thus in 1954 the bulbs were again dried off and moved to La Jolla, Calif., and planted outdoors in January 1955. Thus they could not become established during these years, but are now thriving and will most likely flower again in 1957. Due to cultural difficulties, Mr. Culpepper of Alexandria, Virginia, has not had any flowers on his seedlings of this cross up to the present time.

Lycoris x woodii Traub & Moldenke, **hybr. nov.**

Planta hybrida *(Lycoris traubii* x *L. radiata);* foliis hos parentium intermediis glabris viridibus; umbella 9-flora; pedicellis 3—15 mm. longis; perigonio flavo; tubo tepalorum 13 mm. longo, segmentis 6.1 cm. longis, 1—1.2 cm. latis, anguste oblanceolatis acutis; staminibus styloque modice excertis.

Leaves intermediate between the parents, wider than in *L. radiata,* with a whitish stripe in the center, glaborus green; umbel 9-flowered; pedicels 3—15 mm. long; flowers with shorter tepaltube (13 mm. long) than in *L. traubii;* tepalsegs 6.1 cm. long, 1—1.1 cm. wide in contrast with 6.7—7 cm. long, 1.2—1.5 cm. wide in *L. traubii;* perigone with yellow color dominant; stamens and style moderately exserted from the perigone.

Notes.—Creech (Nat'l Hort. Mag. Apr. 1952, pp. 167-173) reported the reverse of this cross, *Lycoris radiata* (fertile form) ♀ x *L. traubii* ♂ (under the name *L. aurea)* which was made in 1950. The chromosome number of this cross from root tips, determined by Don Wetherell of the University of Maryland as 2n=19, has been reported by Dr. Creech in the paper cited.

CROSSING TWO TEXAS **ZEPHYRANTHES**

Fred B. Jones, *Corpus Christi, Texas*

Two of the most widely differing of Texas' eight or nine *Zephyranthes* are *Z. pulchella* J. G. Smith and *Z. drummondii* D. Don, the latter still known in horticulture as *Cooperia pedunculata.* The two differ in color, form and size of the perianth, length of the tepaltube, foliage, time of opening, flowering season and habitat.

The bulbs of *Z. pulchella,* the golden-yellow rain lily of the southwestern part of the state, flourish in normally dry situations where water stands several inches deep after a heavy rain. The blooms come in the late summer and early fall months and it is an impressive sight to see an acre or more of these tiny golden stars raised above quiet, shallow water. Opening near sunrise and closing at sunset, the flowers exude a faint fragrance. The leaves are dark green, long and narrow and appear with the flowers.

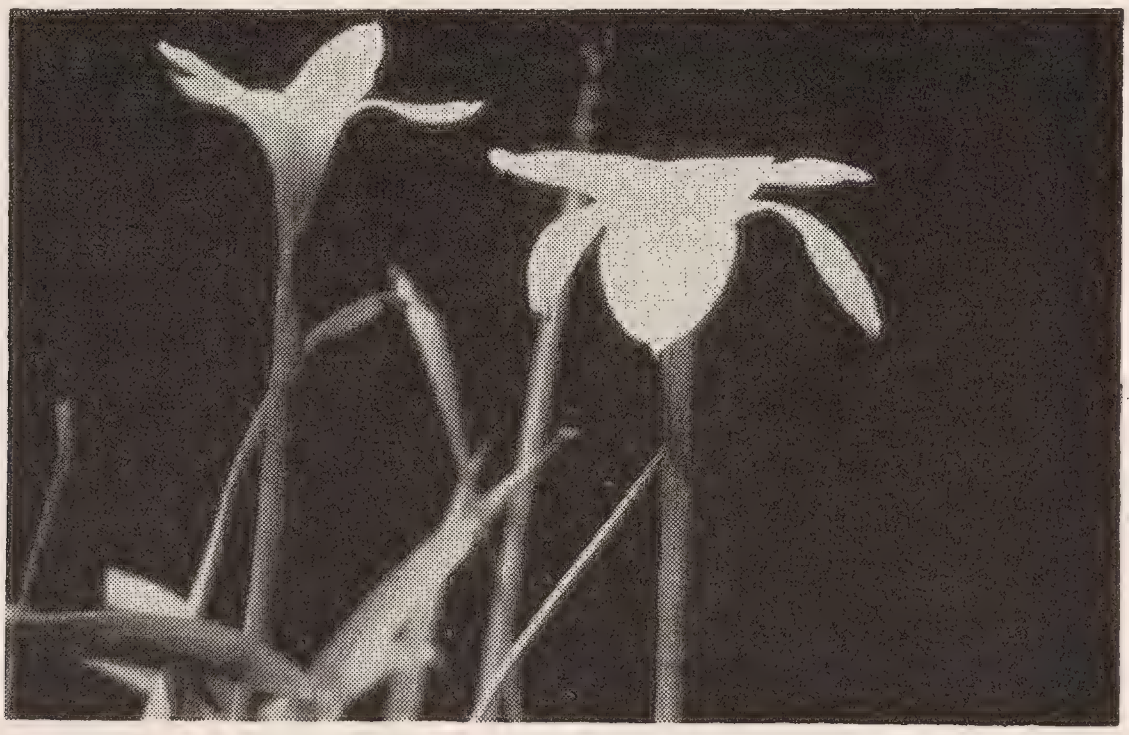

Fig. 24. Left, *Zephyranthes* hybrid—*Z. pulchella* J. D. Smith x *Z. drummondii* D. Don, Apr. 27, 1956. Seeds planted summer 1952. Right, *Z. drummondii* D. Don. Photo by Fred B. Jones.

Z. drummondii D. Don is quite different [Fig. 24]. It is a larger plant in all its parts, growing widely over the state, and in contrast to *Z. pulchella,* seeks everywhere the high ground where drainage is good. The large snowy-white flowers appear in the spring months. If, as sometimes happens, no showers occur in spring, then the bulbs will bloom normally in summer or even in the fall. The flowers are highly fragrant, open in mid-afternoon and remain open throughout the night. The stigma consists of three linear parts, rather than three rounded lobes as in *Z. pulchella,* and it is entirely hidden in the long tepaltube. At the mouth of the tube are arranged the rather inconspicuous stamens. The leaves are broad and distinctly glaucous, being especially noticeable during the winter months.

It was in the summer of 1952 that the writer, having observed these two species in their natural haunts on many occasions and having for several years cultivated them in his garden, was given an opportunity to try to cross them; for it so happened that both species came into bloom at nearly the same time. Emasculating three or four of the white flowers of *Z. drummondii,* an abundance of the golden pollen of *Z. pulchella* was dusted on their stigmas. Two capsules reached maturity and their seeds germinated readily. Three years later, in the spring of 1955, several of the seedlings bloomed, but all were white and closely resembled the maternal parent, *Z. drummondii.* Just as expected: maternal forms! (See article on parthenogenesis, *Herbertia* V, 1939). A year later, in April, 1956, a heavy shower brought to life this batch of bulbs and perhaps two dozen scapes appeared. It was soon evident that two flowers would be yellow, proving that a chromosome exchange had taken place four years before. Both flowers were primrose yellow, not golden yellow; one was somewhat close to *Z. pulchella* in form and size, the other more closely resembled *Z. drummondii.* The latter hybrid was photographed beside a rather typical example of *Z. drummondii* [Fig. 24]. It will be noted that in respect to length of the tepaltube, width of the segments and size of the perigone, this hybrid is influenced strongly by its golden paternal parent. The stigma has three rounded lobes, yet it barely emerges from the mouth of the tepaltube. The flower inherits the fragrance of its maternal parent but opens not in mid-afternoon or early at sunrise, but in mid-morning. The foliage is glaucous but not as wide as that of *Z. drummondii.*

Would one have had reason to expect two such contrasting species to hybridize and produce an offspring having a mixture of the traits of both parents? Perhaps so, for Sydney Percy-Lancaster, the venerable horticulturist of New Delhi, India, succeeded long ago in crossing a close relative of *Z. pulchella (Z. citrina)* with *Z. brazosensis,* a close relative of *Z. drummondii.* (See *Herbertia* III, 1936). Despite this fact, it came as a surprise that these two particular species, often occupying the same general locality in south Texas, could be crossed. It is no doubt true that natural barriers of one kind or another do prevent frequent hybridization in nature. *Z. drummondii,* for example, is self-fertilized shortly after the flowers open, if not before. The slightest movement will cause grains of pollen to fall from the anthers into the open tepaltube and onto the stigma. Yet, infrequent hybridization may occur between not only these particular species but between others whose ranges likewise overlap. But there is no record, so far as this writer knows, of any hybrid populations having ever been found in Texas, that is, of *Zephyranthes.* Certainly, in his own field studies, he has not found one. These results again substantiate the conclusion that the nomenclatural genus *Cooperia* is untenable as a biologic entity and has to be united with *Zephyranthes.*

AMARYLLIS BREEDING REPORT, 1956

JOHN T. WEISNER, *Florida*

Out of approximately two thousand hybrid Amaryllis seedlings I have bloomed several have been selected that are quite outstanding.

Probably the best of the lot is 'Buccaneer' (Fig. 25). This is a very large dark red. In fact it has been consistently the largest flower I have bloomed. It is even larger than 'Red Master' (Warmenhoven) and of better shape. This seedling is a cross between 'Wyndham Hayward' (Ludwig) and a large red seedling that I had.

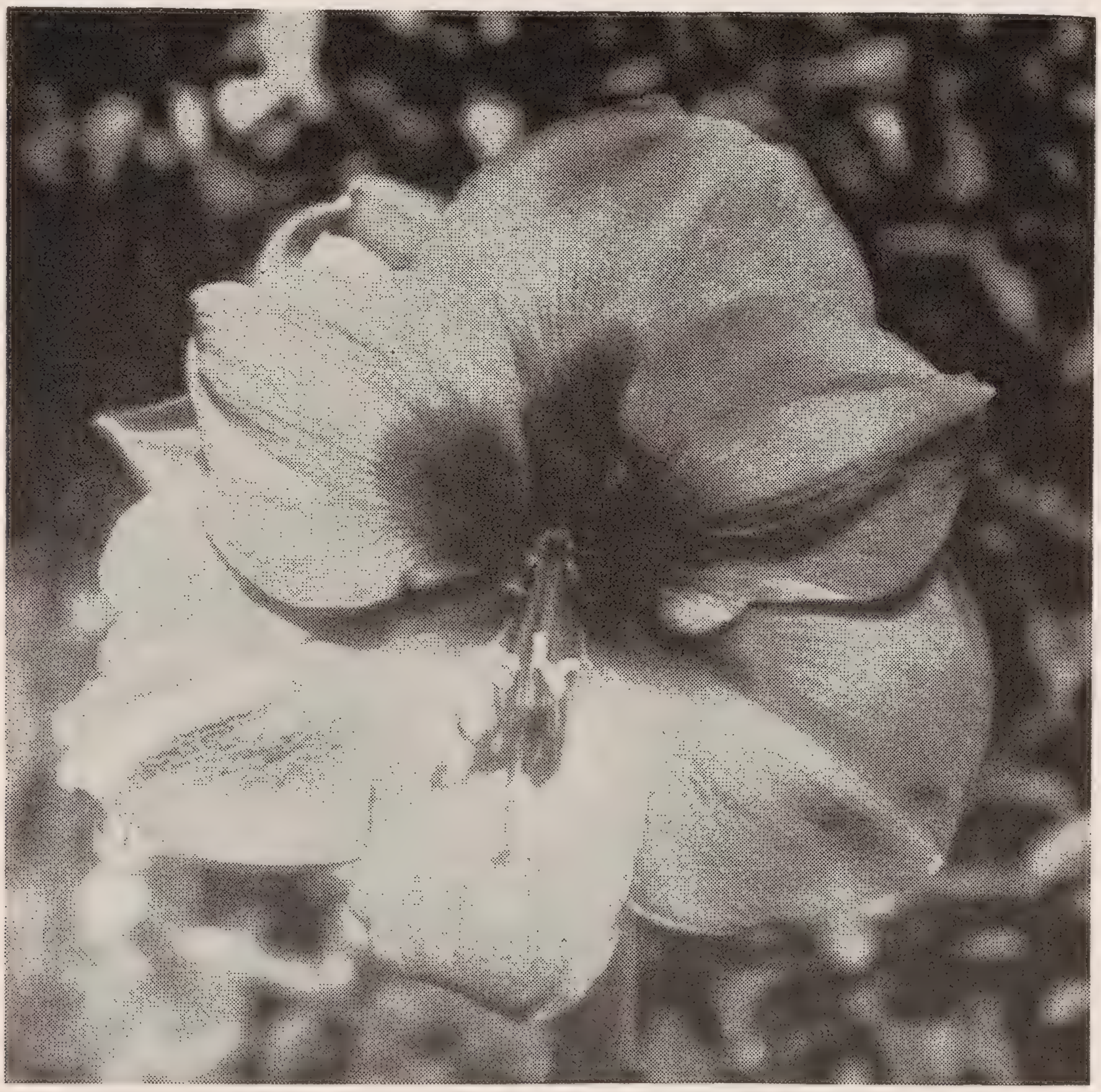

Fig. 25. John Weisner hybrid *Amaryllis*—clone 'Buccaneer'; dark red; flower 10″ in diam. Photo by John Weisner.

'Dr. Robert Moon' (Fig. 26) probably has received more praise than any amaryllis that I have grown. It is hard to describe this color; however, I will say that it is the nearest yellow I have seen in a hybrid Amaryllis. The dark (chocolate) throat sets this flower apart. It was named for a very dear friend of mine who unfortunately had a heart attack while out looking at his flowers.

The rose pink seedling (Fig. 27) has not been named. This flower has probably the best shape of any I have seen in the more imbricated class 5a (Leopoldii). The color is very nice. In my opinion and others who are familiar with the named Dutch hybrid Amaryllis clones, this is far superior to 'Sweet Seventeen' (Warmenhoven), 'Margaret Rose' (Ludwig) and others of this type. This is a cross of 'Margaret Truman' (Ludwig) and 'Queen's Page'. I have propagated this bulb and should have offspring bulbs of sufficient size to bloom next spring.

The salmon seedling has not been named. It has a very flat face but lacks something in shape.

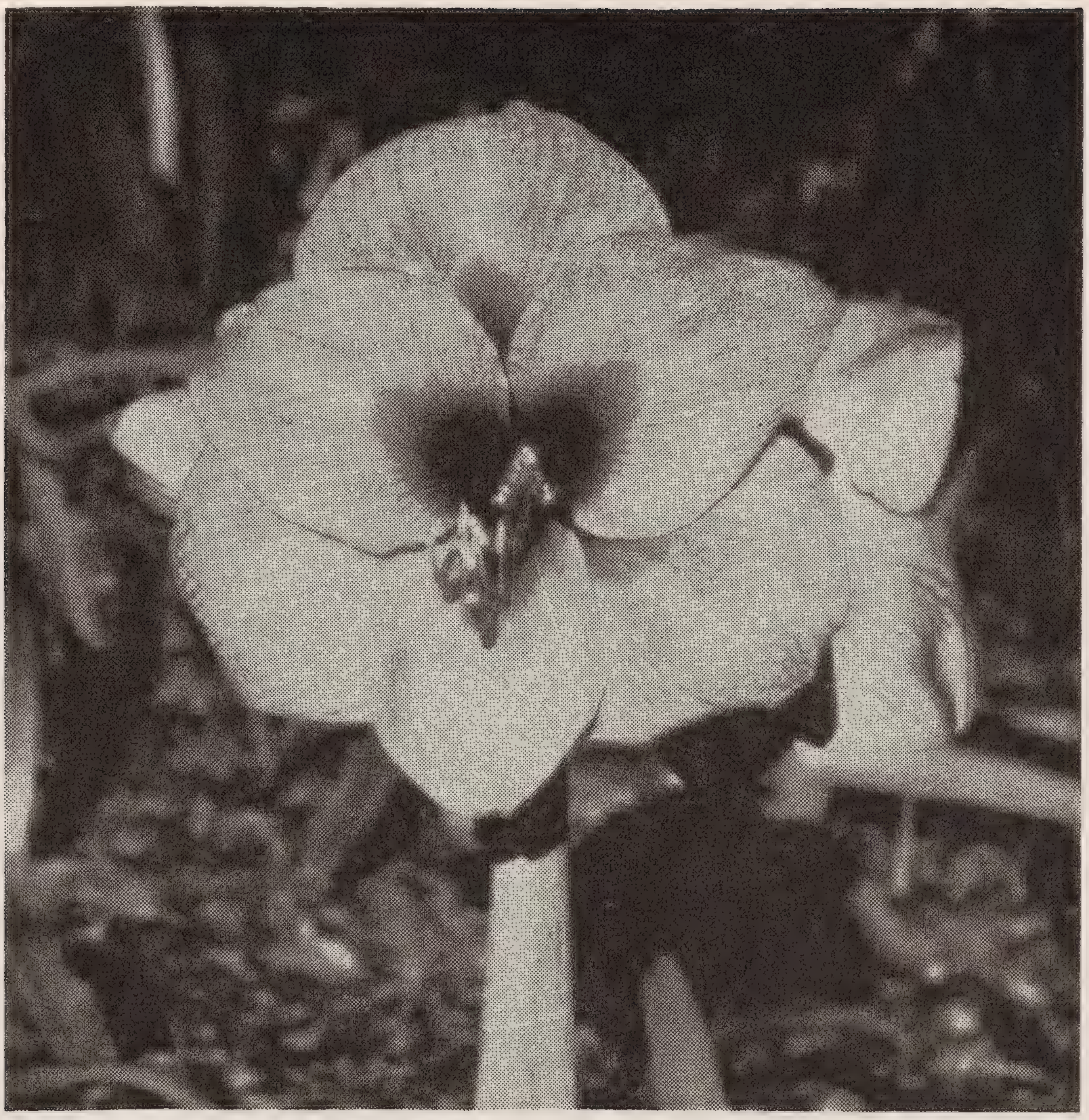

Fig. 26. John Weisner hybrid *Amaryllis*—clone 'Dr. Robert Moon'; very light salmon, darker salmon (chocolate) throat; flower 8″ in diam. Photo by John Weisner.

Seedling #65 (Fig. 28) is better than the average. This is a cross of 'Albino' (van Meeuwen) and pollen from 'White Giant' (Ludwig). It is not an outstanding seedling but is above the average of the whites on the market today.

I have many other seedlings, many of which have definitely been disappointments. Seedlings of 'Pink Perfection' (Ludwig) and 'Pink Favorite' (Ludwig) have usually come true as to color but generally speaking their shapes do not come any way near to those of their parents.

'American Fashion' (Ludwig). This one appears to give the best chance of producing superior offspring. Seedlings of this clone generally have good flower shapes, and the colors are in various shades of pink.

'Moreno' (Warmenhoven), selfed gives good reds of fine shape.

If the breeder is interested in true pinks--baby ribbon pinks—then he should use 'Roselinde' (Ludwig) as the parent (selfed).

More Amaryllis enthusiasts should raise their own seedlings. The reward is great—they will have a Christmas present in each new bud as it unfolds.

I JOIN THE AMARYLLIS BREEDERS

S. W. SAYLER, *Florida*

Amaryllis are my favorite plants. At first I grew many bulbs from seeds of the Mead strain, and wanting to branch out, I bought some unnamed Dutch hybrids. Hybridizations from these produced many fine seedlings which first bloomed in 1955. They were in many colors and shades and of perfect form. This led me to buy a complete color range of named Dutch clones. Seedlings from these will bloom in the spring of 1957. These are from such crosses as 'Bouquet'; 'Marie Goretti' x 'White Giant'; 'Wyndham Hayward' x 'American Express'; 'Doris Lillian' x 'Margaret Truman', and so on.

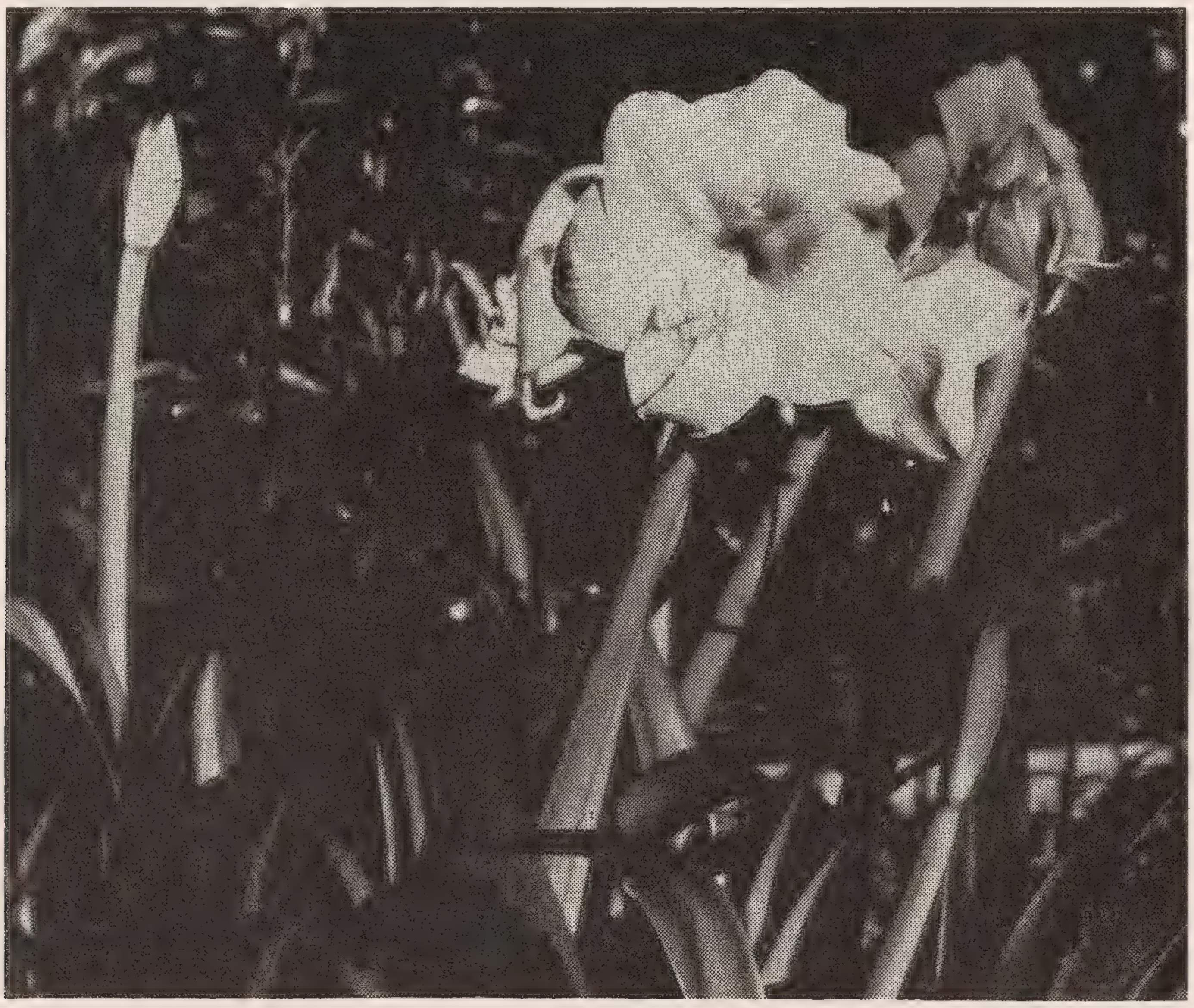

Fig. 27. John Weisner hybrid Amaryllis—clone un-named; rose pink; flower 8″ in diam. Photo by John Weisner.

I am also growing seedlings from John Weisner's hybrids which contain some very fine reds, salmons, pinks and pure whites of perfect form and large size. I also had several seedlings to bloom from Mead strain and Dutch hybrid crosses. These gave some fine flowers of very good form and size, but no real self colors. I see no advantage in such crosses unless for a hardier bulb that can be grown outdoors in Florida. More of these crosses are planned in the future.

During 1955 about fifty of the seedlings produced double flowers, many in self colors. The pollen parents were McCann's double hybrids and *Amaryllis belladonna* var. *albertii* (double).

Seedlings are grown in flats made by removing a four-inch board from the bottom of various sized shipping boxes which have a depth of 6—7 inches. This opening is covered with a piece of hardware cloth (netting) which is covered with a piece of burlap. The flat is filled with good garden soil containing enough sharp sand for good drainage. The seeds are spread thickly over the surface and are lightly covered with sand or soil. As they grow they are given an occasional feeding with a good soluble fertilizer. By spring they will be ready for planting in the garden, and will bloom in three years. It is best to plant seeds soon after ripening for good germination.

The cuttage method developed by Dr. Traub and Mr. Heaton is used. After removing the neck, the bulb is cut vertically down through the base. Several such cuts are made. The cuttings are planted in flats containing clean builder's sand. In a few weeks, the little bulblets form. When large enough they are planted in the garden, and will bloom in about three years with good culture.

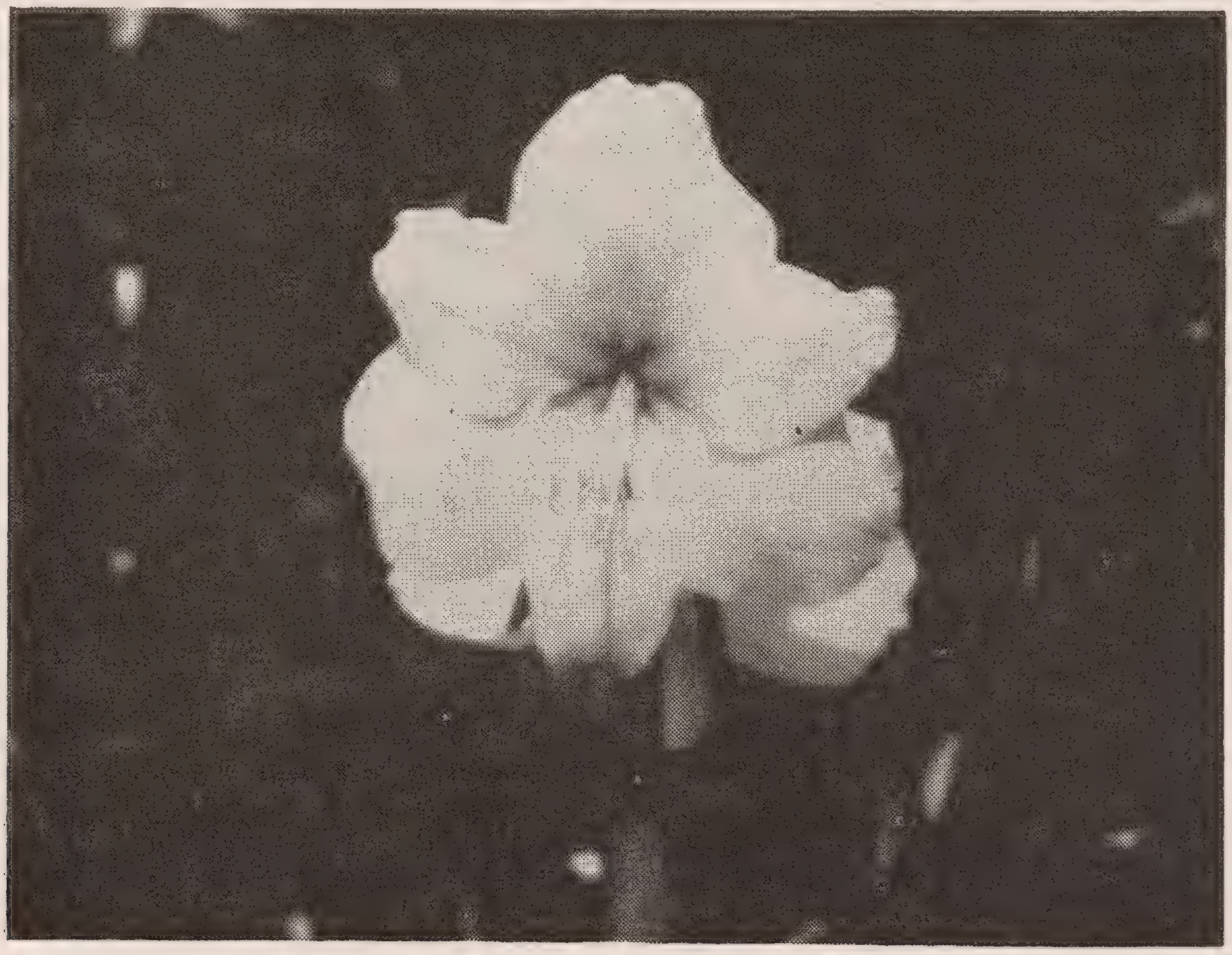

Fig. 28. John Weisner hybrid *Amaryllis*—clone #65; a better than average white; flower 9″ in diam. Photo by John Weisner.

Amaryllis are adapted to a wide range of soils, but good drainage is essential. The potting soil used is made up as follows: 1 part good garden soil; 1 part sharp sand; ½ part well rotted manure. Bone meal is also added. After the bulbs start to grow, an occasional feeding with a liquid fertilizer will be beneficial. Beds in the garden are prepared with extra top soil, manure and bone meal. The bulbs are planted with necks exposed above the soil level. In pots, about half of the bulb is exposed above the soil level. Most of the experiments have been carried on in light shade to full sun.

It is my objective not only to produce clones as good as those produced by others in the past but also to branch out in producing hybrids in the various other divisions. In this way amaryllis will have a still greater appeal.

SEGREGATES IN CAPE BELLADONNA, **BRUNSVIGIA ROSEA** (LAM.) HANN. HYBRIDS, INCLUDING A THROWBACK TO **BRUNSVIGIA GRANDIFLORA** LINDL.

L. S. HANNIBAL, *California*

In the 1955 Herbertia (Plant Life 11: 67-75. 1955), seed color inheritance and breeding patterns in the Cape Belladonna, *Brunsvigia rosea* (Lam.) Hann., hybrids were rerooted. In the present report, the study is extended to include segregation of other characters, including a report on a throwback to one of the other parents, *Brunsvigia grandiflora* Lindl.* [Fig. 29].

During the last few years the writer has flowered a large number of seedling *Brunsvigia rosea* hybrids [Plate 5]. The diversity that has appeared amongst these plants has exceeded all expectations. Initially the numerous flower shapes and color variations were quite confusing, but as time passed definite basic patterns became obvious. As of today over twenty-five specific characteristics have been noted.

A part of these features can be traced to the original species or subspecies (varietal) parentages which have been used, but the wider range of colors and diverse floral shapes which have appeared in recent hybrids are patterns that have resulted from recombinations of genes. Larger size is due to hybrid vigor. These variations have developed to the point wherein accurate description of a clone or type cannot be permanently established or recorded unless we can clearly pinpoint several common or outstanding characteristics.

However, before discussing the diverse features which can be obtained in breeding, it is fitting that a summary of available Cape Belladonna, *Brunsvigia rosea* types and hybrids be given, and where known, that some comment be made about their breeding possibilities. Most improvements in plants are made by bringing out latent or recessive features, and to do this one must work with heterozygous material in place of homozygous or stable strains. Named types or horticultural clones to be found in California are as follows:

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* Editorial Note.—The reader should note that Mr. Hannibal presents additional proof that the Cape Belladonna, *Brunsvigia rosea* (Lam.)Hann., is truly a *Brunsvigia*. A few sentimentalists who are not in tune with biological facts have made attempts to keep it separate from *Brunsvigia*, and they have even made attempts to appropriate the name for the American Belladonna, *Amaryllis belladonna* L., for this *Brunsvigia* species. Such attempts are both contrary to the biologic facts and also the International Code for Botanical Nomenclature.
—*Hamilton P. Traub.*

BRUNSVIGIA ROSEA TYPES

Brunsvigia rosea major:—Our most common garden form of the Cape Belladonna which has been in cultivation since the sixteenth century when it was introduced into the Mediterranean area. It is unquestionably the *Brunsvigia rosea* (Lamarck) of the literature, but is larger and more hardy than the wild forms usually found about the Cape. As a breeder it is too homozygous in composition to be of much value for breeding. *B. rosea pallida:*—Commonly called *minor* and likewise widely distributed. This clone flowers a month later than *major,* is smaller in stature and has pale pink blossoms. As a breeder it often yields plants with exceptionally large blossoms. The narrow foliage, slender scape, and occasional tendency of producing cream pink blossoms when crossed with the *B.* x *multiflora* types suggests that this plant is far more distinct in character than is evident from the blossoms. It is worth trying as a breeder.

B. rosea rubra bicolor [Plate 5] :—a late flowering deeply pigmented form occasionally found in California gardens. It may also be the old English *purpurea* since the *bicolor* coloring becomes a deep purple in cool weather. However, it normally satisfies Truffout's plate in Flores des Serres, t. 1415, 1861. The plant probably holds little promise as a breeder.

B. rosea Frank Leach :—A seedling from an unknown source found more than 60 years ago in a Berkeley garden by Mr. Leach. The plant has a heterozygous chromosome makeup and its seedlings have turned up with everything from 'Blanda' to Varabilis or Picotee types.

BRUNSVIGIA ROSEA

HYBRIDS WITH OTHER **BRUNSVIGIA** SPECIES [Plate 5]

B. x *parkeri:*—The true form from Kew has very wide petals with bluntly rounded tips. Since it is a *B. grandiflora* x *B. rosea* cross like the *B.* x *multiflora* hybrids it is well worth using as a breeder, particularly since many of the seedlings have very broad petals.

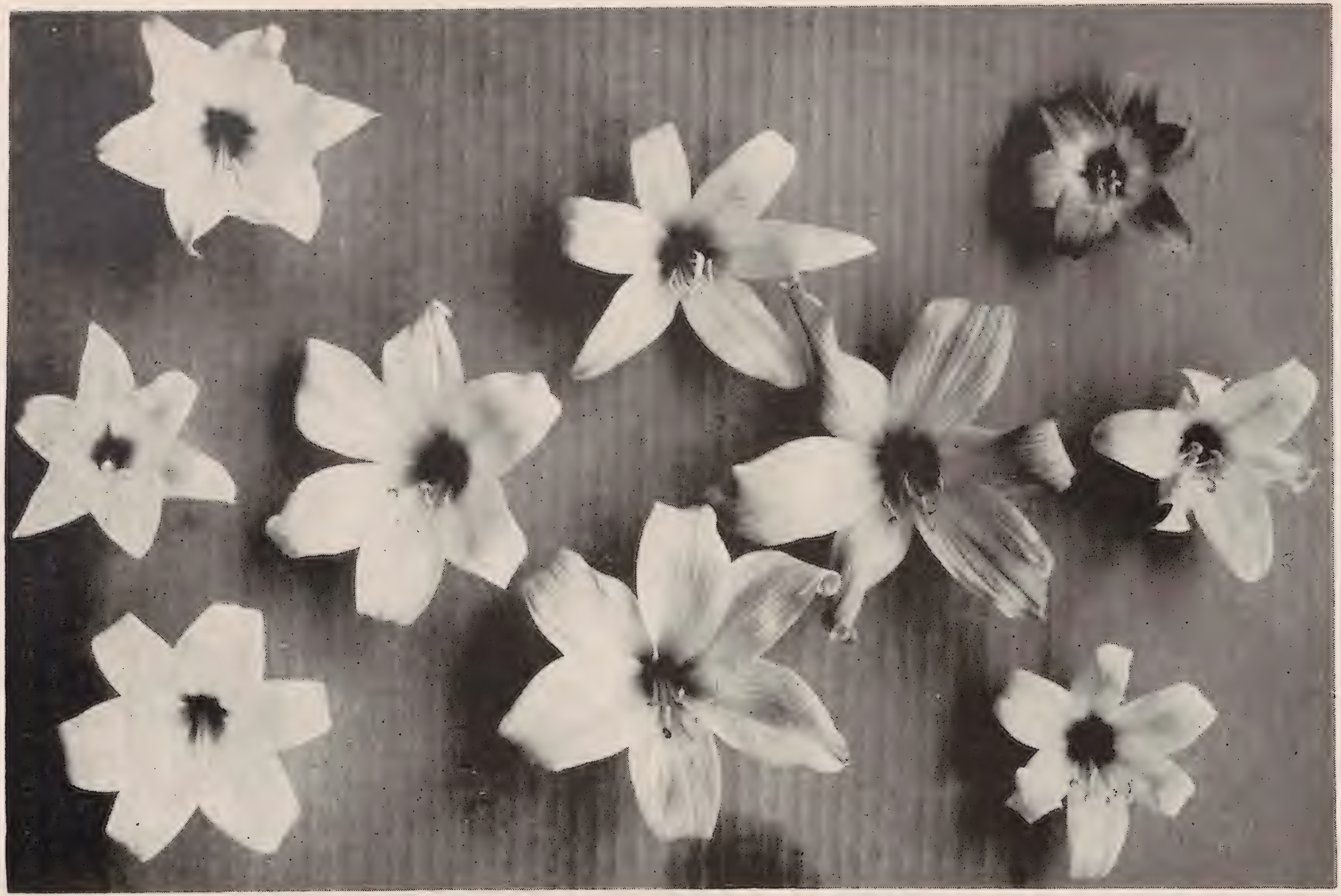
B. x *multiflora alba:*—First introduced from Australia by Mrs. Bullard, then by Mr. Orpet. A fair breeder but tends to give very similar *alba* seedlings when selfed.

B. x *parkeri alba:*—Identical to the *B.* x *multiflora alba* forms.

B. x *multiflora rosea:*—Several similar forms are in cultivation and are capable of yielding either *alba* or colored seedlings depending upon the breeding techniques used.

B. x *multiflora* 'Hathor':—The large well known white Multiflora introduced by Bradley in 1911. As a breeder this plant has no peers if used as a seed parent. An apparent genetic translocation makes it possible to obtain a great diversity of seedlings which range from typical *B.* x *multiflora alba* to some very vividly colored rosea hybrids.

B. x *multiflora* 'Glory':—This Allister Clarke hybrid yields a great variety of highly colored seedlings, some of which are practically throwbacks to *B. grandiflora* Lindley, which is included in its parentage [Fig. 29].



Flower of the Cape Belladonna, **Brunsvigia rosea** (Lam.)Hann. var. **rubra bicolor** (top row, third from left); and floral diversity in **Brunsvigia** hybrids, involving the Cape Belladonna and other Brunsvigia species—**Brunsvigia** x **multiflora: Top row,** left to right, (1) blunt-tipped broad tepalseg form, (2) white semi-spider form. **Center row,** (1) long-trumpet form, (2) large-flowered form, (3) clone 'Blazing Star', (4) white orchid-flowered form. **Bottom row:** (1) smooth broad-tepalseg form, (2) clone 'Pacifica', and (3) rolled tips with narrow setepalsegs. Photo by L. S. Hannibal.

Plate 5

B. x *tubergenii:*—A *B. josephinae* and *B. rosea* hybrid which has been introduced from Holland, but as far as the writer knows has not been used in further breeding. It should be crossed with the Multifloras at the first opportunity.

Elwes Hybrid:—the clones known as *B. rosea purpurea major* and *B. rosea rubra major* which were introduced by Elwes and used as breeders by Van Tubergen to give rise to the colorful Van Tubergen hybrids known as 'Kimberley', 'Pretoria', 'Jagerfontein', etc. A few of these bulbs have been imported over the years and may be well worth crossing with the Multifloras. But it is quite probable that in warmer climates these colors blanch out and thus the clones may not be too outstanding.

DISCUSSION

Most of the above described bulbs are not difficult to obtain. In addition to these there are numerous *B.* x *multiflora* 'Hathor' and *alba* hybrids which Mr. Orpet and others about Santa Barbara have placed on the market. Many of these have more promise as breeders than do some of the named clones above.

However this report is more concerned with the numerous new floral features which are turning up amongst the diversity of new hybrids which the writer has recently flowered or observed. The early workers with daffodils, *Hemerocallis,* or *Amaryllis* hybrids encountered similar confusing floral patterns, and these have now been cleared up by systematic classifications of flower types and characteristics. The methods for each differ in minor respects but the benefits derived from such studies have always eliminated the prevailing confusion and have been of advantage to collectors and breeders. Plants can be scored as to features and types, and improved types can be bred by having a clearer insight regarding the goals and characteristics desired. *Brunsvigia rosea* has been in horticulture since 1712; it is time that its potentialities be known.

Color is probably the most noticeable feature in any type of blossom, but with these hybrids it has been found to be an elusive factor since many clones are temperature and flower age sensitive. The normal variations in weather can bring about marked color changes. A sharp drop from day temperatures of 80° or 90° F. to 60° F. or less will turn many near whites into deep pinks or lavenders. Deep pinks in turn may become wine-purple or "purpurea" patterns, or "bicolors" will become solid pinks. Thus color is far from reliable.

Flower shapes [Plate 5] for any particular clone are far more specific. There may be minor differences between the first and last flowers to open from the same umbel, but these are rarely significant. In most instances floral shape promptly establishes the hybrid type or strain, and thus the flower shape is the first feature to examine.

Basically there are two distinct petal patterns, an elliptical shape and a linear shape. The elliptical shape is a rather broad petal with a relative blunt tip. A representative is that of *Brunsvigia* x *parkeri* as best example. *B. rosea major* and *B. rosea bicolor* are fair illustrations. In contrast the linear or *Nerine* type petal is usually rather narrow, being only half or three-fourths of an inch wide and five or six inches long. The throat to the linear typed flowers is seldom constricted as with the blossom to the elliptical petals, and this tends to enhance the tendency of the petals to reflex. Many of the *B.* x *multiflora alba* types tend to evolve to this pattern with the extremes of the type resembling large well reflexed Nerines when in flower.

Obviously there are intermediate petal patterns which fall between the elliptical and linear types. With a little practice one can decide quite readily if they are semi elliptical or semi linears. A relatively rapid flare at the base of the petal establishes the linear pattern.

Secondly the petal tips should be examined. Some can be quite blunt, and others drawn out to a lance tip. *B.* x *parkeri* is distinctly blunt, whereas *B. rosea major* is inclined to be lancelike. 'Hathor' has an elliptical petal, but the tip is distinctly pointed. Strangely enough, some of the most linear petals are particularly blunt, which yields a choice type of blossom. One may ask if petal length determines the type of tip. It may to a partial extent, but some short petals are lance tipped and numerous long ones are blunt.

Petal tips can be deeply V-channeled along the mid rib as with 'Hathor', or they can be flat in cross section. Usually the V-channel accentuates the lance tip, but at present this detail has not been too closely examined as to petal types, thus the interrelationships are not clearly defined. In a few instances clones have appeared where the sepaline segments rotate 90 degrees about the midrib producing three vertical standards.

Petal texture is quite varied with ruffled forms like 'Hathor', or non-ruffled forms with smooth glistening surfaces which closely resemble the purity of a Madonna Lily. The ruffled or crinkled condition appears to be due to an irregular cellular growth. This feature is attractive, but is not as select as are some of the larger smooth textured, well reflexed hybrids.

There is wide diversity in the reflexing habits of petal tips to different clones. Usually the broad elliptical petals with blunt tips do not reflex too readily, whereas the tips of linear petals may roll back upon themselves several times. The ruffled texture or the V-groove to the petal tip often tends to distort the reflexed roll of the petals, causing the tepals to assume airy spirals or twists, and giving the blossoms rather unusual shapes. Such a distorted blossom with appropriately vivid colors has led to the establishment of Orchid, Nerine, and Spider types of blossoms.

As already noted an unconstricted throat gives rise to an open flower. Constriction creates a well defined trumpet as found in *B. rosea major* and most species forms. Accentuation of the trumpet is possible, but does not yield show flowers. In some recently developed seedlings the near absence of any throat gave rise to some very flat faced flowers.

It had been an assumed fact that the trumpets or throats of all *B. rosea* blossoms were uncurved, thus the recent flowering of a D. C. W. Chandler seedling caused the writer to reconsider this point, as the trumpets to this clone were quite curved. Not knowing the history of

Chandler's seedlings we have no means of tracing the cause, but the curved tube suggests the presence of *Brunsvigia josephinae* in its make-up, which is not improbable.

Umbels are another means of plant type identification. The blossoms can be in either a compact or open arrangement, depending in part upon the length of the pedicels, and then secondly, there is a tendency for the umbel to either turn all flowers to the sun, or to orientate the blossoms in a radial pattern as with the *B.* x *multiflora* types. The number of flowers can range from six per umbel for some of the Stellenbosch subspecies of *B. rosea* to 40 or more for some of the larger 'Multiflora' hybrids. Numerous flowers, long pedicels, and a radial umbel can be accepted as reliable evidence indicating the Australian source of many hybrids containing ''multiflora'' blood which are now on the market.

Each clone has a very specific flowering date. The *B.* x *multiflora* forms are nominally late flowering, but some of the recent hybrids flower in October, giving a flowering range of three months. This late flowering characteristic is of particular interest to the cut flower grower since it extends the time that flowers should be available for the market. The source of such a factor appears to be present in only one or two clones, other than 'Glory'.

Flower colors, as mentioned are quite diverse. The white or alba flowers all lack color pigmentation. This condition is recessive and is nominally associated with the *B.* x *multiflora types.* Some seedlings of *B.* x *parkeri* have been reported to have yielded white clones also, but the writer has never observed such a condition with his Kew plants.

Color may vary from light solid pinks, to bicolors, variables (where the color changes with age), purples, near reds, Picotees, peppermints (red and white striping), and orchid patterns. The pale pink Blanda and Picotees patterns can be derived from the intro-specific hybrid Frank Leach. *B.* x *parkeri* contributes no end of variables; lavender shades appear in some of Hather crosses with purpureas. The orchid types and peppermints are all derived from Allister Clark's great ruffled red ''Glory''. For show bench blossoms the flat solid colors, such as are present in *B. rosea major* have little to offer unless coloration is very intense. The bicolors and peppermints attract the most attention and intensification of these shades is quite desirable.

It often takes several years to properly evaluate colors for any one specific clone, and it is the writers opinion that the average daytime temperatures should be noted if a RHS number is applied. Likewise readings should not be taken at dusk or in the late afternoons as the red pigments are over accentuated. No color evaluations should be made at temperatures 95° F, or higher as heat breaks down pigments. During hot weather most good pinks wash out to a dirty white.

Most *B. rosea* clones indicate some yellow pigmentation in the throat of the blossoms. This is most pronounced when the flowers first open. In a few deep red purple blossoms this yellow shows up prominently on the exterior of the trumpet giving a copper bronze hue. George Cowlishaw named this type 'Sunset'. The shading is derived by crossing with *B.* x *multiflora rosea.* The deeply shaded types developed by the writer have been referred to as the 'Stormy Sunset' series. Occasionally yellow pigmentation is sufficiently evident in white hybrids to give these a cream shade.

Both George Cowlishaw and the writer have maintained for some years that the *B.* x *multiflora* hybrids contained the blood of *B. grandiflora* Lindley, and that J. C. Bidwell or John Baptist had been in error in stating that *B. multiflora* Aiton (B. orientalis) was the missing parent. From time to time types have appeared which resemble the missing Eubrunsvigias in a number of ways. In October 1955 the writer flowered a deep coral pink hybrid which in all respects resembles and fulfills the description of *B. grandiflora* Lindl. (See Herbertia 1951, page 52). The appearance of this colorful throwback [Fig. 29] now makes it possible to introduce a new series of *B.* x *grandiflora* types of a particular hardy, late flowering nature. It is quite apparent that the *B.* x *multiflora* foliage, which is distinctly glaucous, is derived from this *B. multiflora* source, as any attempted comparisons to the foliage of *B. josephinae* of *B.* x *vantubergenii* has always created some question.

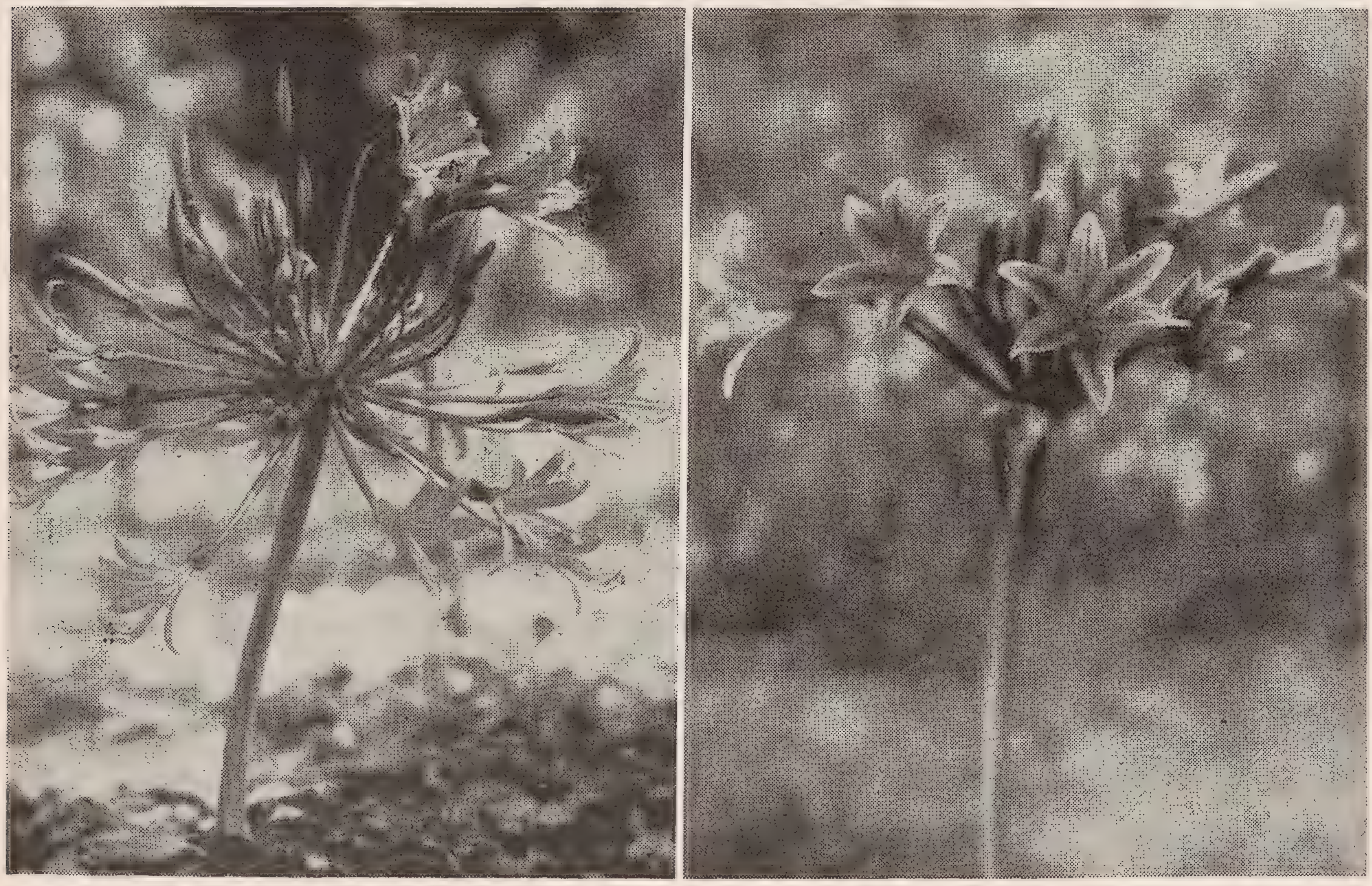


Fig. 29. (Left) *Brunsvigia appendiculata* Leighton; (right) segregate from Cape Belladonna hybrid, *Brunsvigia* x *multiflora* Lindl., thus it is a throwback and indicates that the latter species intered into the Cape Belladonna Hybrids. Compare with Fig. 8, page 52, Herbertia 1951. Photos by L. S. Hannibal.

Arlington Worsley, who raised several hybrid Brunsvigias to the flowering stage has attributed the leafy stem which sheaths the foliage of both *B.* x *parkeri* and the 'multiflora' hybrids to the *Eubrunsvigia* parentage. George Cowlishaw in turn believes the leafy stem is derived from the use of *B. rosea blanda*. The writer is undecided about these views, but has noted that tunicated or pear shaped bulbs may orient their foliage flush with the ground, whereas spherical bulbs usually have a pseudo stem and lift their foliage well clear of the ground. This distinction has appeared in geographical variations of the Cape Town and Stellenbosch forms of *B. rosea,* and could have been accentuated by the use of these bulbs in Australia.

In summing up these many diverse features found in the *B. rosea* hybrids it is obvious that we have a number of dominant factors which are invariably apparent in species or F-1 hybrids, and latent factors (recessives) which may show up in subsequent seedlings. Most *Eubrunsvigia* features are recessive, such as the radial umbel, long pedicels, narrow petals, or spherical bulb. Ruffled texture, or absence of pigmentation (alba flowers) appears to be derived from structural hybrid sources containing *B. grandiflora* blood. Selfed seedlings of Hathor usually yield about 75% elliptically shaped petaled forms. However only a very small percentage of these Hathor seedling result in plants with petals that are as broad as those of the parent. Presumably Bradley selected Hathor out of a great number of special crossings. The story of this hybrids development would be an interesting one if it were known. Bradley's daughter reports that Hathor was a chance seedling found flowering in the garden. Most of Hathors selfed seedlings have unruffled petals, but one should not conclude that this ruffled condition is recessive since practically all of 'Glory's' crosses have ruffled petals.

Intensely colored hybrids are not overly common. Less than a half dozen good clones have been obtained, with the exception of some of Glory's seedlings and the 'Stormy Sunset' series from the *B.* x *parkeri* x *B.* x *multiflora* crossings. However, the throwback *Brunsvigia grandiflora* Lindl. (Fig. 29) seedlings mentioned above gives promise of introducing strong color genes into future hybrids.

Nominally the back-crossing of colored forms with alba types gives pale pink shades, but this is not always true. The writer is now inclined to believe that the color gene may still be present in the alba clones, but is so located as to be inactive. Crossing with colored clones occasionally reactivates this inert color gene, giving fairly deep pinks, or on a few instances an entirely new color such as the light lavender pattern which recently turned up. These 'Lavenders' are quite distinct from the old English 'Purpurea', a clone which the writer now considers to be none other than our ''cold sensitive'' rubra bicolor. Unfortunately most of these lavender clones do not have good floral substance and the bulbs have been disposed of.

Just what the future holds for *B. rosea* hybrids is becoming rather unpredictable. Two generations of cross breeding here with heterozygous hybrids has given no end of surprises. *B. grandiflora* Lindl. has been recovered as a throw-back hybrid [Fig. 29], and is available for further backcrossings. Even *Nerine* x *fletcheri* (the *Nerine bowdenii* x *B. rosea* cross) gives promise of future breed-possibilities. It is rather obvious that the hybrids are mostly semi-segregating or sometimes non-segregating in breeding habit. But come what may, clear cut identification will no longer be quite so difficult to establish.

[PLANT LIFE LIBRARY—continued from page 84.]

FEATURES OF EVOLUTION IN FLOWERING PLANTS, by R. Good. Longmans, Green & Co., 55 5th Av., New York 3, N. Y. 1956. Pp. 405. Illus. $6.00. The purpose of this book is to redirect attention to facts concerning evolution in flowering plants, to show that "some at least, of the best known speculations about organic evolution are seen to have less general applicability than is usually claimed", and to summarize the author's conclusions on the subject. The book is in three parts—background to flowering plants, review of the whole group with special reference to evolutionary problems, and a small selection of problems which single out plants of special interest in the story of evolution.

AN INTRODUCTION TO THE BOTANY OF TROPICAL CROP PLANTS, by L. S. Cobley. Longmans, Green & Co., 55 5th Av., New York 3, N. Y. 1956. Pp. 357. Illus. $7.25. The purpose of this book is to survey the botanical features of the more important typical crop plants—cereals, sugar cane, fiber crops, oil-seeds, pulses, starch-storage crops, spices, beverages and drugs, fruits, vegetables, rubber and essential oils. It is designed as a text for agricultural students in the tropics and elsewhere; it is also of interest to all who, in any capacity, deal with tropical crops and their products.

THE OLD SHRUB ROSES, by G. S. Thomas. Chas. T. Branford Co., P. O. Box 41, Newton Centre 59, Mass. 1956. Pp. 224. Illus. $6.50. This charming book concerns the re-discovery of the old shrub roses in the gardens in Europe and the United States (by G. S. Thomas), and notes on the origin, evolution and genetics of our garden roses (by Dr. C. C. Hurst). The book is in two parts—the development and cultivation of the rose, and the old roses in cultivation to-day. A must for all who are interested in roses.

THE COMPLETE BOOK OF GARDENING AND LAWN CARE, by W. PEIGELBECK. Random House, 457 Madison Av., New York 22, N. Y. 1956. Pp. 144. Illus. $2.95. This practical book is "for everybody who has found the average gardening book hard to read, . . . complicated." It begins with the preparation of the site, covers the various gardening operations; and ends with the control of pests, and a gardener's calendar. Even the experienced gardener may be interested in the variety of ideas concretely presented.

PLANT PROPAGATION AND GARDEN PRACTICE, by R. C. M. Wright. Criterion Books, 100 5th. Av., New York 11, N. Y. 1956. Pp. 192. Illus. $4.50. Originally written for British gardeners, this refreshing text has been carefully edited to conform to American gardening conditions. It gives "step-by-step instructions on such important subjects as air-layering, budding, chemical sterilization, cross-breeding, cuttings, grafting, pollination, seed propagation, thinning, transplanting, . . . weed control," and details for the propagation of various cultivated plants. Highly recommended.

A SOURCE-BOOK OF BIOLOGICAL NAMES AND TERMS, 3rd ed., by E. C. Jaeger. Chas. C. Thomas, Publ., Springfield, Illinois. 1955. Pp. 317. Illus. This revised edition of a standard work includes also a supplement of more than 1000 new entries. In the introductory sections, the building of names and terms, types of names, applications of names, and so on, are considered. The Greek, Latin and other elements from which scientific biological names and terms are made are listed alphabetically. Their meanings, and examples of their use in nomenclature, are concisely given. This is a must for students, teachers and workers in the biological sciences.

DISEASES OF FRUIT CROPS, by H. W. Anderson. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 1956. Pp. 501. Illus. $8.50. This excellent new book was written for research workers, teachers and practicing horticulturists. It furnishes detailed information on the diseases of the pome fruits, drupe or stone fruits, brambles, grapes, strawberries, gooseberries and currents, cranberry, and blueberry, in the temperate zone, both in America and in foreign countries. Highly recommended.

[PLANT LIFE LIBRARY—continued on page 130.]

4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

THE AMAZING **LYCORIS**

O. R. Johnson, *New Jersey*

The *Lycoris* members of the Amaryllis family are indeed a very interesting group and well worthy of wider use, specially in view of their easy growth and natural ease of multiplying which makes for practically trouble free growing and greater flower economy.

True, the interest in them during the past few years has increased considerably, however, in many sections of this great country of ours they would produce rich bloom at a time when most other lilies have finished blooming. This alone is a valuable asset to thousands of flower lovers.

So that you may better understand some of the following passages, I will explain my position concerning *Lycoris.* My wife, my two sons and myself have operated for a number of years the firm of Johnson Bros. P. O. Box 463 Bound Brook, N. J. and more recently a bulb range close to the seashore at Barnegat, N. J. additionally.

We specialize in imported hybrid *Amaryllis* and *Lycoris* bulbs. The photos in this article showing the foliage stage and the blooming stage of *L. Squamigera* is a planting of nearly 10,000 of these bulbs which we had imported from Japan. Since we are amateur photographers the photos [Fig. 30] fail to do full justice to the planting but will suffice to give you an idea what we are trying to convey to you in the article.

Since most of our work with *Lycoris* has been with *L. squamigera,* also known as the hardy *Amaryllis hallii* and commonly called ''Magic Lily of Japan'', we will discourse on this one first.

L. squamigera is amazing in more than one way. For instance it thrives equally well in Maine or Michigan as it does in the gulf states and Florida. Over the years we have shipped this variety to nearly all the states and our repeat orders originate country wide.

It is almost unbelievable the amount of punishment and neglect this species will take and still bloom well and multiply normally. For example: one season our shipment of these bulbs from Japan reached us in January, late. They came in crates and the weather was close to zero and they had been unloaded from the ship and placed in storage on the unheated dock awaiting plant quarantine and customs procedures which usually take a few days.

Eventually we had them at our place and filled all backorders advising customers to hold them in a cool location until soil thawed; then plant them according to instructions. We held the unsold bulbs until late May (not having time to plant before) and planted them out to observe their reaction from what we thought might be their finish.

But no such thing occurred, in November they produced a small rosette of leaves, coasted through the winter unchanged and early in March the foliage really took off and grew into a healthy mass of dark green. This foliage died down completely in mid June and on August 10th the bud stems alone without foliage appeared and within a few days the buds separated from each other and gradually, one after the other, opened out in full bloom of exquisite light pink, tinged lavender. Such performance as this receives our deepest admiration and we thank GOD for such outstanding bulbs.

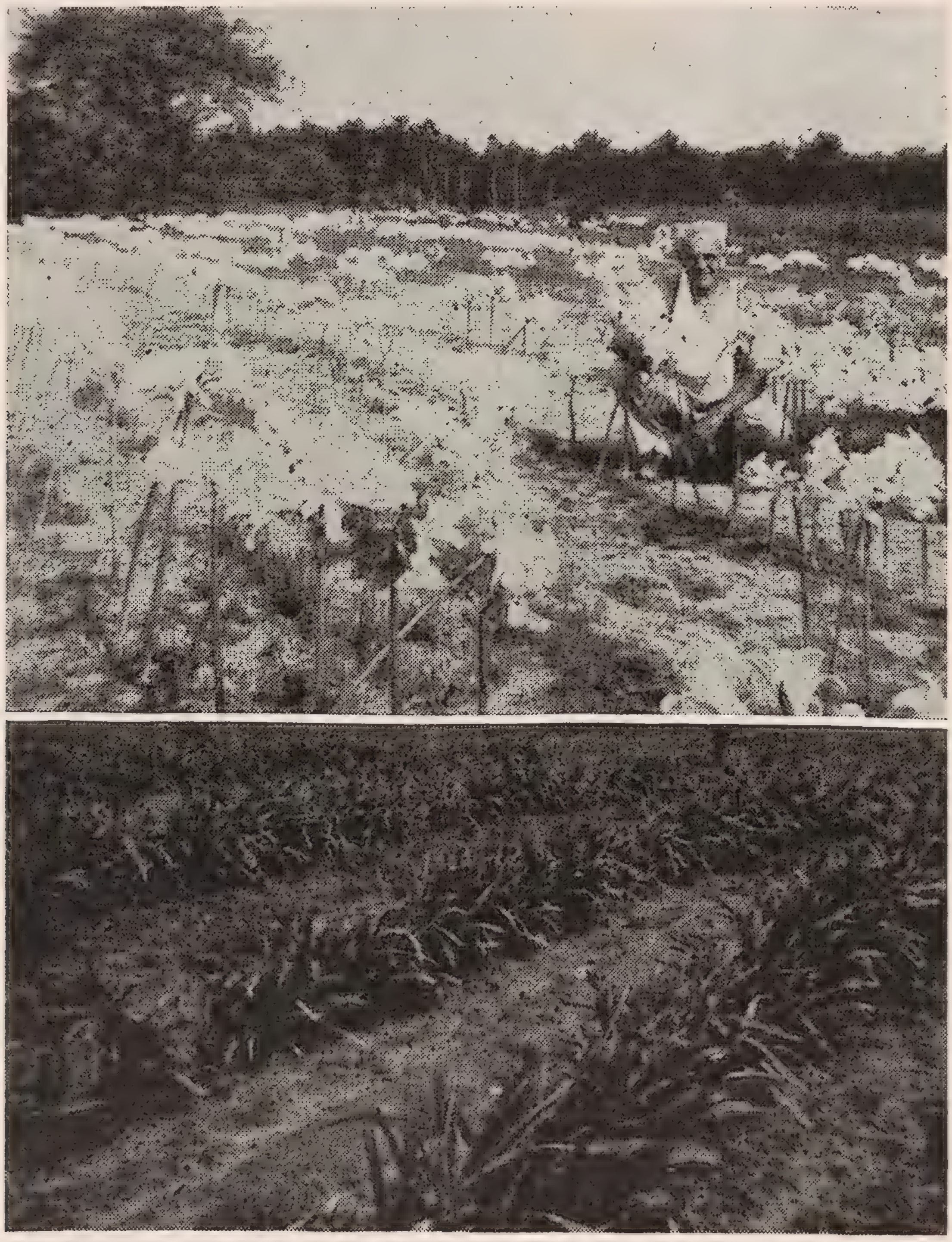


Fig. 30. *Lycoris squamigera* Maxim. (upper) in flower, Aug. 15, 1954; (lower) leaves before dying down, May 1954. Johnson *Lycoris* fields, New Jersey. Photos by O. R. Johnson.

We suggest planting and growing instructions for *Lycoris* species as noted toward the end of this article.

Lycoris radiata. This species is a duplicate of the *L. squamigera* with the exceptions that the flower stem is shorter, the blooms smaller and solid medium red, blooming size bulbs much smaller and blooming period about three weeks later. The strap leaves are much smaller both ways and have a distinct grey stripe thru their center lengthwise. Just as hardy as *L. squamigera* and planted only half as deep. If planted deeper they fail to bloom.

Lycoris aurea, the Golden Magic Lily. This variety produces a rich medium yellow bloom late in October on stems about 18″ tall. We've tried to winter this variety over here in New Jersey but to no avail to date, however, we continue to try to find some method of growing it. The deep south and the west coast generates the keenest interest in *L. aurea* as well as the middle south since it is not necessary in these areas to dig the bulbs up each year to save them.

As for *Lycoris radiata alba,* this variety produces a rich ivory white bloom but otherwise is in the same category as *L. aurea.*

Lastly, *Lycoris sanguinea,* the last variety we've added to our *Lycoris* list, and the one we have the least experience with, puts forth a small salmon pink solid bloom in October on short stems to 12″ tall. We have included this species this season in our wintering over trials here. From our short experience with it we classify it with *L. radiata* (red) in characteristics except for hardiness, bloom color and gray stripe thru leaves.

Lycoris species are native to upper Burma, China, Japan and Korea. Those mentioned above produce blooms with petals partially recurved. We import ours from Japan and each season we endeavor to order in excess of the hardy types so that we can plant out the excess to grow on and make good stock with roots.

We feel that supplying our customers with bulbs with live roots they will be better served. Since we are unable to date to winter over some species we therefore do not supply these with live roots.

Blooming size bulbs range in size as follows:

L. squamigera 5″ circumference
L. radiata 1½″ circumference
L. sanguinea 1″ circumference
L. radiata alba 4″ circumference
L. aurea 4″ circumference

We have found from growing these bulbs at both our places (70 miles apart) that those grown at the shore in sandy loam produce slightly lighter color in blooms than those grown in heavy soil at our other place; and the bulbs grow better in sandy loam. Propagation is by bulb division which forms naturally. We feed *Lycoris* bulbs once yearly when vigorous foliage growth begins using concentrated plant food such as Spoonit, Miracle Gro, etc.

PLANTING AND GROWING LYCORIS BULBS

The Lycoris species belong to the Amaryllis family and are very interesting and amazing in their performance.

Most spectacular bloom appearance is obtained by planting bulbs in groups, any shape, 12 inches apart rather than planting in rows. The row method can be used well if it is to be a background planting. In planting *Lycoris* alone we suggest a supplemental plant, such as the petunia, planted in front to detract from the naked appearance of the *Lycoris* flower stems which bloom without foliage about mid August for *L. squamigera* and a few weeks later for the other varieties.

Foliage dies down early in the summer, the bulb rests; then flowers appear, and following this, the foliage starts to show and grow slowly through the fall and quite heavy in the spring.

Lycoris squamigera should be planted 4″ deep in the Philadelphia area. North of this area plant 5″ deep; below the Philadelphia area plant 3″ deep; but in the deep south plant only 2″ deep. This variety grows flower stems 18″ to 30″ tall, and is hardy.

Lycoris radiata (red) is handled in the same manner as *L. squamigera* except that it is planted only half the depth. Flower stems of this variety grow 12″ to 18″ tall; and it is also hardy.

Lycoris radiata (white), *L. aurea* (golden), *L. sanguinea,* blood-red-scarlet. These three varieties are not hardy north of the Richmond Washington area. Have been successfully grown in Oklahoma and on Pacific coast and wintered over. Where not hardy they can be pot grown quite well. In planting out use depths recommended for *L. radiata* (red).

Plant all *Lycoris* bulbs in well drained, rich humusy soil in either full or part sun, water well when planting and plant bulbs upon arrival. Dig and divide when too many flower stems develop too close together which is from three to five years.

In most cases *Lycoris* bulbs require a season or more to become well established and perform normally. When pot growing the tender varieties, transplant in the open garden when soil becomes warm, and dig and repot before frost for indoors, being careful not to disturb ball of roots in handling.

We suggest a winter mulch for all Lycoris planted out as a precautionary measure except in the deep south.

LYCORIS IN NORTH CAROLINA

Mrs. Mary Katherine Klottz
(as told to Wyndham Hayward)

One of the favored sections of the United States for *Lycoris* culture is the Piedmont Section of North Carolina. Miss Elizabeth Lawrence has reported previously on the growing of various species of *Lycoris* in her garden writings, and now new information comes from Mrs. Mary Katherine Klottz, of Salisbury, N. C., also in the Piedmont section.

Mrs. Klottz reports:

Lycoris squamigera (Amaryllis hallii) the 'Magic Lily', does well here, the foliage comes up in early spring and the pink blooms come in midsummer.

"*Lycoris incarnata,* a closely allied species to *L. squamigera,* behaves in similar fashion, the foliage coming up in spring, and blooming its flesh-pink flowers in mid-summer.

"Bulbs of *Lycoris 'purpurea'* in my garden under this name seem to be identical with *L. sprengeri,* the foliage appearing in the spring, and blooming in mid- to late summer. The coloring of the flowers is rose-pink with a bluish cast on ends of petals.") [This is possibly an important observation as there has been much conjecture as to the actual identity of bulbs offered by the Japanese dealers as L. 'purpurea'. (Not *L. squamigera* var. *purpurea)*.—W. H.]

[The most important observation in Mrs. Klottz's report is on the habit and blooming of *Lycoris caldwellii,* first described in this issue of HERBERTIA—W. H.]

''*Lycoris caldwellii* as obtained from Lakemont Gardens has bloomed well for me and is a beautiful light yellow! Very much like *Lycoris albiflora* from Japan, in form, but larger. Another difference is that in North Carolina the foliage does not come up until the spring (like *L. squamigera),* whereas the foliage of the Japanese *L. albiflora* comes up in the fall. The flowers of *L. caldwellii* are just fading when the flowers of *L. albiflora* are coming into bloom. The *L. caldwellii* flowers on scapes are about two feet tall and the umbel six or seven inches across.

''The character of the foliage and the time of its emergence would seem to place this species *(L. caldwellii)* in the group with *L. squamigera, L. incarnata, L. sprengeri* and *L. 'purpurea'* having a longer dormancy period. The leaves of all of these are a light bluish gray or slate-colored, with some variation. *Lycoris* aurea is not hardy here and does not bloom reliably in my garden experience.

''*Lycoris albiflora*—The foliage comes up in the fall, and the bulbs bloom in late summer, and while the flowers are called ''white'' in the price lists and other descriptions, to me the color is more of a pinkish cream in the specimens that I have. I have bulbs received under the name of *L. albiflora* var. *carnea* (Japan) blooming side by side in my garden and if there is any difference between the two, I cannot tell it.

''*Lycoris radiata*—the well known *Red Spider Lily* of the South. The narrow foliage comes up in the fall, soon after the blooms fade. It is the last *Lycoris* flower of the season to bloom here in the fall.

''These bulbs all bloom abundantly with me with very little attention. At time of blooming the bulbs are in partial shade; however when the foliage is up it receives sun a good part of the day. As my garden is on the west side of the house it does not receive the very early morning sun at any time. This seems to be an important factor with the success of some Lycoris. Trees provide partial shade at the time of blooming.

''Salisbury, N. C., has a moderate climate, typical of the cool Piedmont section of the state. Our temperature seldom goes below 10 degrees above zero, F. One night about 15 years ago it went down below zero, but such extremes are very rare. We often have temperatures in the low 20's. Last winter we had temperatures of 12, 13 and 14, several nights. Our winters are usually characterized by alternate freezing and thawing, often with the ground freezing at night, and thawing the next day.

''The ground may stay frozen for several days at a time in cold spells. Sometimes we may have above-freezing weather for days at a time in winter. Our first killing frost usually comes about the middle of October. However, we have not had one yet this year (Nov. 6, 1956). Some winters we have no snow or only light snow flurries. But we usually have one good snow for the children of four to six inches. January and February are the coldest months, although our largest recent snow was on March 1, 1927,—14 inches. We often have late spring freezes that destroy the fruit crops and kill lilies emerging from the ground.''

Editorial Note.—Mr. Sam Caldwell, of Nashville, Tennessee, has located a source of *Lycoris radiata* bulbs that set seeds profusely. He obtained these from a lady living in Georgia. The members interested in breeding *Lycoris* should obtain this fertile stock. The sterile stock usually available is excellent for blooming but is practically useless to the breeder since it may never set seeds, although its pollen may probably be used on other fertile *Lycoris* species.—Hamilton P. Traub.

LYCORIS TRAUBII IN GEORGIA

Wm. T. Wood, *Georgia*

In 1936 I imported from Japan several items that included 10 bulbs labeled ''*Lycoris aurea.*'' I am not familiar with *Lycoris aurea* which is cultivated in the St. Augustine, Florida, region. My imported species has broad tepalsegs and is therefore *Lycoris traubii* [Fig. 13] as named in this issue of Herbertia.

The imported bulbs were planted in a light soil in semi-shade, and fertilized with bone meal. They bloomed every year since but have not been fertilized in the last five years. The flowers were smaller than usual this year which is apparently due to crowding and lack of fertilizer. They have multiplied and in addition they have re-seeded to some extent.

LYCORIS AUREA AS AN OUTSTANDING POT PLANT

Hamilton P. Traub, *California*

Lycoris aurea, the beautiful golden lycoris from China, is not hardy above the lower Southeastern states, south Texas and central and southern California. However, that should not prevent gardeners above this belt from growing and enjoying this outstanding plant. In the 1940's and early 1950's, the writer carried on an experiment which showed conclusively that *L. aurea* could be grown successfully in pots. It was in fact one of the most showy subjects in his collection.

In 1946, Wyndham Hayward, that stimulating and catalyzing horticulturist, sent several bulbs of *Lycoris aurea* of the St. Augustine strain that is naturalized in gardens on the west Florida coast. He suggested that the writer make a close study of this species under greenhouse conditions in Maryland. The writer had lived in Florida for 10 years in the 1930's and early 1940's and he had noticed that the constant summer rains did not harm the flowering qualities of the dormant *Lycoris aurea* bulbs. He therefore decided to simulate the Florida conditions under greenhouse culture. Three bulbs were potted in each of two 8-inch pots with the long bulb-necks above the soil surface. They were never allowed to dry out but were watered copiously and fertilized regularly during the growing season—fall, winter and spring. When the leaves began to die down in early summer, *Begonia evansiana* tubers were planted in each of the pots beside the bulbs, and water and fertilizer was regularly applied during the summer. The begonias made a fine display, and these died down in the early fall about the time that the lycoris blooms appeared. After a number of years, the pots were literally filled with lycoris bulbs and it was no longer practicable to grow begonias in the pots with the bulbs in the summer months. Thereafter the pots containing the lycoris bulbs only were regularly *watered* but not fertilized during the summer dormant period.

Under this culture the bulbs thrived and bloomed regularly each fall and increased regularly by splitting of the bulbs. When the writer moved to Arcadia in 1952, the bulbs were planted outdoors and they continued to flower regularly. When they were again moved in 1954 to La Jolla, they still flowered, and bloomed regularly in 1955 and 1956. All of the other lycoris species resented transplanting and have not bloomed as a rule since moving to California, but in their present location outdoors, they are gradually coming back to the flowering stage with fine leaf growth each year. They will most likely bloom again in the fall of 1957.

Thus the important fact to remember in the pot culture of *Lycoris aurea* is to keep the bulbs watered throughout the year. Of course there must be excellent pot drainage at the start. After the pot becomes rootbound, then the danger of insufficient drainage is over because the roots lap up the moisture rapidly. It is obvious that repotting will be necessary after five or more years when the pot is filled to overflowing with bulb offsets. Then again one should start with three bulbs in each 8-inch pot.

Although this experiment was carried out under greenhouse conditions, it should be possible to apply the results to pot culture in the home if the gardener will make an effort to allow the plants to produce full leaf growth through the winter and spring months indoors. This is all important since the flower buds in the bulbs are formed during this growing period. Sufficient light should be given in a southern exposure. After the flowering period in the fall, the tall foliage is quite ornamental and should add to the window display.

PRODUCTION OF AMARYLLID BULBS IN HYDROPONIC CULTURE

Carrol L. Klotzbach, Hydroponics, Inc. Cayey, P. R.

Being a professional grower in hydroponics I am probably more aware of the misapprehensions current concerning the culture. While it does not live up to the repute given by many promoters (intent on selling farms, chemicals and blue sky) there are some interesting results to be reported.

The usual hydroponic bed and the one found most successful is generally from three to four feet wide, made of concrete, well drained by means of a tile covered trough in the center which also serves as an irrigation conduit. There is a slope from sides to center of 1¼ inches and the gravel depth averages eight inches. It is in such beds that my experiments have been carried out with no special treatments in the way of solutions, those used at the same time were irrigating various other crops such as tomatoes, cucumbers, melons, lettuce, etc.

Since the solutions used are usually of first interest and are usually much overblown in importance let us start with them. The quantities shown are for 100 gallon lots, the figures are not precise to the fine decimals. In practice the phosphorus component varies and serves to buffer or stabilize the pH . . . which same we like at 6.2 though there is no attempt by daily juggling to achieve this level as a constant. For a competent and complete discourse on solutions suggest you see "Soilless Growth of Plants", Tom Eastwood, Rheinhold Publishing Company, New York.

N	90 ppm	using KNO_3	9 oz.	
K	260 ppm	from above salt.		
K	140 ppm	K_2SO_4	4 oz.	
P	90 ppm	Monocalcium Phosphate	56.33% P_2O_5	5 oz.
Ca	300 ppm	$CaSO_4$	18 oz.	
Mg	50 ppm	$MgSO_4$	8 oz.	
Fe	1 ppm	$FeSO_4$	.067 oz.	
B	1 ppm	H_3BO_3	.08 oz.	
Mn.	.25 ppm	$MnSO_4$	.013 oz.	
Cu	.025 ppm	$CuSO_4$	.013 oz.	
Zn	.025 ppm	$ZnSO_4$	.015 oz.	

On large farm areas the general practice is to test and build solutions twice a week, the so-called minor elements are added weekly.

I have been unable to have check plants in soil. However, discussions with bulb growers here indicate that hydroponically grown amaryllis size up faster and tend to offset more than is average in soil. Slicing is also quite successful in gravel culture.

Last fall I sliced ten 3½″ diameter bulbs. (All bulbs and seeds are Ludwig). Each bulb was sectioned into 24 pieces, care being taken to preserve the roots as far as possible. These were immediately replanted in gravel, about half inclined at 45 degrees, the balance vertical. Nearly all "took" and most have produced two fine bulbs and in some cases (and I wish I knew why) a slice has produced six. The slices at 45 degrees did noticeably better than those planted vertical. The same effect has been noted on bulbs purposely so inclined, the number of offsets is definitely increased.

Another method I am in process of trying to prove out consists of slicing off the basal plate of an old bulb just below the scales. The base is immediately dusted with Rootone and (as I so scientifically did it) . . . permitted to lay around in the shade on a workbench. After 50 days I had what appeared to be a nice tiny pearl necklace around the bottom, ten days more and I was able to see that these were not roots forming but fine little evenly spaced bulblets. I then set out the bulb in the gravel bed where it now rests easily among its offspring now numbering twenty-six. There are more to come, additional offsets are popping up through the scales. It appears now that I may lose the old bulb but time alone will tell. At any rate it looks like a good swap . . . and a way of getting a good vegetative increase.

Seedlings have done well also many at eight months measuring 1¼ and 1½ inches diameter. Many have also offsets as small as ½″ dia. and a short time ago I lifted one inch bulbs that had two offsets almost as large as the mother bulb.

My original shipment from Holland of one hundred bulbs gauged a little under two inches diameter. Most of these are now about five inches in diameter and have been in eighteen months. During this time they have had no special care and have been lifted twice to remove offsets and one other time for a move to another bed. Growth has been practically continuous except for the above checks.

I have unfortunately been moving about too much for any real continuity of experiment. One of the importances of the hydroponic method here is that bulbs so grown may be shipped, being clean and free from soil borne diseases and parasites. Another is that here the work of keeping down weeds and grasses is so great as to inhibit good growth and any chance of profit.

Another that has done very well is Ismene Calathina, mine are away ahead in size and number of offsets to a simultaneous soil planting. I have had to revise my spacing estimates after only six months of trial on these.

Spacing on the amaryllis seedlings is such that I have 3,000 growing on in a 125′ x 3′ bed, spacing approximately 3½″ x 4″. Expect to lift and separate offsets in about one year and at the moment it looks as though I shall have perhaps 2,500 bulbs 2½ to 3 inches to sell and enough offsets to plant three beds. On all that I shall report when it happens.

I shall appreciate comments from readers on this behavior. What I have reported may be of no particular interest, it may be that far better results have been achieved in field culture.

To summarize. I think hydroponic methods will be valuable to the small grower engaged in commercial production. I do not think the method suitable for the hobbyist except those of the most rabid variety.

The advantages seem to lie in the (perhaps) increased number of offsets, the elimination of weeding, difficulties of soil irrigation, fertilization, borers of course are generally out of the picture. One can also produce clean and, if care is taken and no bad luck sets in, disease free stock. It may be mentioned that with most media one irrigation per day, except in very hot dry weather, should suffice. Also that good results may be had by using mixed materials such as Hyponex, thus eliminating test equipment requirements other than some means of determining pH. Small tanks of solution could be built, used for ten days and replaced in their entirety with no great waste.

My first copy of HERBERTIA is at hand. I am now one of the rabid variety mentioned above, I assume there is no cure for chronic ''amaryllitis''.

EVALUATION OF DUTCH HYBRID AMARYLLIS

Nell Pickard, *Houston, Texas*

As I look back over my past years of *Amaryllis* experience, my first thought is how much pleasure these plants give for so little care. By the nature of its hardiness and long period of bloom, the Dutch hybrid *Amaryllis* lends a splendid feature to our garden. Gaining rapidly in popularity, *Amaryllis* are truly one of the most up and coming perennials we can choose.

Amateurs and professional growers find them easy and interesting, the flowering scapes displaying from two to four lovely blooms that last for days in the garden or as cut flowers. The beautiful strap like foliage remains attractive through the summer. My garden is shaded by several Mimosa trees which are decidious, making a nice early Spring garden.

Many excellent Dutch hybrid *Amaryllis* clones are offered on the market of which I have many growing in my garden bigger and better each year. It is the personal opinion of the writer that the Dutch Hybrids are so superior in form, color and texture to the usual Mead strain mixtures. The former are also just as easy to grow. Much misinformation is passed in regard to growing Dutch *Amaryllis* by those who do not purchase the best hybrids and know very little about their habits and culture or likely have some of their own seedlings from some flower merely bearing the name *Amaryllis*.

If you care to grow your own from seed, select the very best parents to raise the level of bloom quality. As you study *Amaryllis,* you will become more particular about the flower types you choose for breeding. The majority prefer wide flat faced blossoms. Others consider some of the trumpet shapes as worthwhile. Many of the fine strains imported have figured prominently in the breeding of some well known American strains on the market today.

While most of the Dutch Hybrids are similar in form, a well trained *Amaryllis* enthusiast will soon learn to distinguish the different forms. Fortunately the Dutch Hybrid clones come in a pleasing price range to all. Just bring one good *Amaryllis* into flower and you say it is worth the cost.

For the past several years, Mr. Thomas Manley's excellent reports have been carefully followed. Space will not allow comments on all the lovely Dutch clones and their fine qualities but I will mention a few of my favorites that have rated perfect in performance in the garden.

'Doris Lillian' (Ludwig) is a very clear deep rose, petals do not recurve but give the appearance of a large bloom. 'Pink Perfection' (Ludwig), after two years in the garden, has bloomed with grace and a delightful rose color. 'Bouquet' (Ludwig) is always glamorous. It is a deep salmon overcast with pink with a deep rose throat. Stamens are also dark. A true novelty for any garden. 'Margaret Truman' (Ludwig) is a very pretty rose, with rose stamens and dark throat.

'White Giant', (Ludwig) excels all the whites in my garden with its lovely wide petals flat and round, with great substance, and fragrance.

The fine strains of reds are unlimited and are always very popular. 'Wyndham Hayward' (Ludwig), is particularly outstanding as a red and quite worthy of the honorable name. 'Red Master', (Warmenhoven) is a huge dark red and is certainly an asset to any collection. 'Queen Superiora' (Van Meeuwen) will always be among my favorites. Very large with crinkled ears in the throat. Excellent dark red, growing more beautiful each year.

The miniature form, Amaryllis ''Gracilis'', DeGraff strain, blooms every year and cause much comment due to their small size and perfect form.

Amaryllis striata and its varieties should not be overlooked as pot plants, they offer attractive rewards to the flower arranger. With all of its fine qualities one wonders why the species is not more widely known. The Gulf Coast area, especially Houston, Texas, has proven to be a hospitable home to the Dutch Hybrid *Amaryllis* and species. The rate of natural increase from offsets is not so fast as some strains but they are all well worth waiting for.

One of the chief landscape possibilities of *Amaryllis* lies in the fact that the bulbs can be left undisturbed for several years. If one plants them in good loamy soil, and a moderate amount of fertilizer is given during the growing season, a light shading from the hot sun will keep the foliage in good condition. A light mulch should also be used to keep the ground cool in summer and protected in winter. The Dutch hybrids usually are dormant in late fall after the bloom scapes are made. If it is necessary to take the clones out of the ground they should be repotted immediately. It is not necessary to remove them for a drying off period. I have observed that when the same bulb blooms in the garden over a period of several seasons, the color will be more intense. Light and shade also play their role in color. As to length and texture of stem, it has been found that adding a little more nitrogen will make for longer stems in most bulbs. Some bulbs are marketed that are too small to produce the expected size of bloom. Also a good bloom will only come from a well rooted bulb.

In conclusion, I would like to mention that very little difficulty has been experienced with the growing of Dutch Hybrid *Amaryllis* and the clones have adapted themselves to our conditions and I sincerely hope that these few lines may induce a wider use of the most worthy Dutch Hybrid clones.

HYBRID AMARYLLIS — THE POTTED QUEEN

ROBERT G. THORNBURGH, M.D., *California*

Let the gentle reader not mistake the title of these remarks that the conclusions were arrived at by the use of potables. Others have thought of the hybrid amaryllis as a queen since that regal title has been used so frequently in the naming of their varieties. Whether they merit the title of queen or not, no one will deny that they are so outstanding when seen that near-by flowers are likely to go unnoticed.

It is still difficult to find good clones but in spite of this, due to our Dutch cousins and their efforts, beautiful strains of hybrid amaryllis are available although in short supply. Though not difficult to grow, they mature just slowly enough to make their production on a commercial basis less profitable to most bulb producers. We have heard that the English produce fine hybrid amaryllis and that excellent strains also are produced in Australia, yet they are not sufficient in amount to show up in the United States markets. Accordingly, we have those energetic people in Holland to thank for what little of the finest varieties of hybrid amaryllis we can get.

This is an excellent place to mention to those who are insistent that named sorts be clones that in this respect there are two companies who have proven utterly reliable. Ludwig's and van Meeuwen's produce clones in all their named sorts that year after year prove reliably the same. Bear in mind that there can always be a mix up in packing bulbs or after passing through several hands it is possible to mix them up. Usually this accident does not happen for the very reason that most retailers do not wish to disappoint their customers by such carelessness but hope to get their reorders the following year. There are firms who regularly produce hybrid amaryllis in named sorts who after running short substitute similar non-clone bulbs with similar colors using the same clone name for the substitute.

It is probably the opinion of a good many including myself that van Meeuwen's have the finest reds obtainable. In the same way it could be said that Ludwig's have the finest whites and the finest pinks that can be obtained at this time. This is a statement not easy to make since van Meeuwens' has a top bracket named clone in 'Albino' and Ludwigs' have two red clones that have not been excelled by anyone. These are 'American Express' and 'F. D. Roosevelt'.

Last year of all the newly observed red bulbs it would seem that van Meeuwens' 'Alcyone' and Ludwigs' 'F. D. Roosevelt' were the most impressive. Both of these were several tables above 'Red Master'. Of the whites I have yet to see a better one than either 'Ludwigs' Dazzler' or Marie Goretti. Of the pinks, Ludwig's 'Pink Perfection' still maintains superiority. 'Doris Lillian' is the best of the rose varieties.

This year several new varieties have been introduced but were received too late for blooming and report but they will be reported upon in the next issue of HERBERTIA. Of these Ludwig's 'Five Star General' is a signal red with a white star center. It should be a good change from so many self colors. It would seem that with the introduction of that refreshingly different and gay variety, 'Candy Cane', that Ludwigs' is continuing the good work in the introduction of a wider range of color patterns. Van Meeuwen has had a variety of light red with a white star center called 'Rose Queen' that has always been in such demand that it is usually difficult to obtain unless ordered early in the season. Many of you will recall van Meeuwen's introduction of a strain several years ago called "Graceful" which was written up in the HERBERTIA. They were deep self reds of miniature *Amaryllis striata* stock but were sold out and now are no longer in the market. For those of you who missed obtaining one of these it is to be recalled that the Ludwigs also carry a fine *A. striata* miniature strain called ''Gracilis'' and that these, though not named as clones as yet, are to be obtained in several color shades. Some of them are even red and white. They are quite hardy, offset well and are less expensive. Those that I have brought to bloom have been unusually good self colors. It should be said that Warmenhoven's is the only company that has one of these, apparently derived from *Amaryllis belladonna,* in named variety. It is called 'Christmas Joy' and is a bright self scarlet. It has bloomed for me over a two year period and, believe it or not two of them bloomed on the second year on Christmas day, the first to show up in pots. That made it worthy of its name.

The following descriptions are from personal observations and therefore only opinion, not scientific fact. The salmon shades have seldom held much appeal, whereas all bright colors such as reds, pinks or whites seemed far more attractive. Perhaps you can forgive so many high ratings as a manifestation of a personal enthusiasm held poorly in check. In the past several years a search for more varieties that contained outstanding contrasts has been made. Ludwigs' 'Candy Cane', van Meeuwens' 'Rose Queen' and Ludwigs' 'Apple Blossom' have filled a much needed place. This year the new variety 'Five Star General' has been offered for the first time by Ludwigs'. Actual picotees are practically unobtainable since they were taken off the market by van Tubergens' especially in named varieties. They are to be found in great abundance, however, at the Howard and Smith nursery in Monetebello, California but one must select them while in bloom around Easter time.

The late Hermon Brown strove for a purple variety in his last efforts to produce good varieties. As yet only Warmenhovens' have approached this color in their 'Violetta' and this shade is noted only in its bud stage. The yellow hybrid amaryllis is still as scarce as a Loch Ness sea serpent. A yellow color can be seen, however, in the throat of 'Ludwigs' Dazzler' one of the best white varieties now to be found.

WHITE

'Ludwig's Dazzler'.—This one is undoubtedly the best white hybrid amaryllis obtainable today. It is a sturdy bulb and sends up blooms with such good substance that the face of blooms are flat. No green present, only a little touch of butter-yellow tint in base of throat. Very round and flat. Grade AA. Ludwigs.

'Marie Goretti'.—Ludwigs. Grade AA. It is indeed difficult to choose between this and the 'Ludwig's Dazzler' and if only one were available, this one might well be the choice. It is exceedingly graceful with its delicately wavy margins. Try to obtain one of these.

'Leading Lady'.—Warmenhovens. Grade B. This is an excellent white much resembling 'Marie Goretti'. It was rather tubular and did not open well perhaps because at the time it was a bit overheated in the bright sun light and dry surroundings. Two scapes of two blooms each per bulb. Also had undulating margins and cool green throat. The second scape opened very well though still of the tubular shape but it was pure white anteriorly with only minimal green along the keel of petals posteriorly.

'Queen of the Whites'.—Five of these bulbs obtained last season opened with flat face but every one had very narrow tepals leaving space between tepals often clear to base of bloom. Every blossom had pink streaks on the upper two anterior petals. These were all grade C except one which was rated C plus. Warmenhoven.

'White Giant'.—Grade A. Another white that frequently justifies its name. Ludwig's.

'Albino'.—van Meeuwen; Grade A. A very satisfactory white and the only one that this company keeps regularly on the market which speaks for its quality.

BICOLORS

'Apple Blossom'.—Ludwigs' Grade AA. This may well be the best of the varigated blooms offered by Ludwig's today. After observing it bloom for a period of two years I feel that it is one that I can hardly do without. It has brought much comment from those who have seen it in bloom here. Strangely enough this variety can hold its own in combination with other hybrid amaryllis of more vigorous hue and still appear outstanding. It mixes well with combinations of red, white or pinks. The throat is white with greenish tint with a button of red directly at the base of the throat. The tips of the tepals take on the blush pink tint of the flower that its name commemorates.

'Candy Cane'.—Ludwigs', Grade A. This is one of the most definitely marked varieties that show a symmetrical pattern on its face. There is no other duplicate of this offered anywhere. It is a mandarin red, 17/1, on the Royal Horticultural Colour Chart. Tepals have short stripes coming forward from the throat for half to two-thirds distance to tip. The border is outlined by same width of stripe of white. This is a striking bloom but placed next to more brilliant colors loses its charm.

'Clarence M. Harvey'.—Originally found at the Howard & Smiths nursery. It is identical in pattern to Ludwig's ''Candy Cane' except that the color is currant red, 821/1, giving the impression that it is maroon. This has not shown a vigorous tendency to offset and as yet nothing has been done to multiply it vegetatively.

'Five Star General'.—Ludwig. Although this one was received in the month of February this year (1955) it was not in time to bloom for this description. It is likely to prove very good from the pictures that were made of it in black and white. It has a shape much like Ludwig's 'American Express' but has a wide border of signal red with a white star-shaped center. Since this one seems to multiply very slowly even with cuttage, it will be scarce for a while.

PINK and ROSE SHADES

'Pink Perfection'.—Grade AA; Ludwig. This one is still the best of all the pinks. Not only is it really a solid pink but it is vigorous and will multiply, offset, set seed vigorously and even divide occasionally on its own by cleavage and yet go on the next year and do the same in a most vigorous self-perpetuating manner. The tepals are not apt to be wide unless the bulb is large but with a good unmolested root system the bloom will even be large on a medium sized bulb. If you can only afford one pink, this should be it. Carmine Rose 621.

'Doris Lillian'.—Grade AA; Ludwig. This is quite a bit like 'Pink Perfection' except that the color is a deeper rose being very bright at first, a cherry 722/3 but changing as the flower ages. Perhaps the form is more often better than that of 'Pink Perfection' but on a small bulb the tepals tend to be narrow too. It is as vigorous as 'Pink Perfection'.

'Margaret Truman'.—Grade AA; Ludwig. Again this is a toss up as to this one or 'Pink Perfection'. Perhaps it is the equal. Carmine rose 621.

'Love's Desire'.—Grade A plus; Ludwig. A French rose 520 at the tips. In the mid-portion of tepals this becomes a porcelain rose of between 621/1 and 620. Indefinite white central stripe on each tepal. The color seems to be produced in many striate lines that blend into the rose-pink of the tepals. Deep in the throat a soft blended green seems to give just the right touch to bring out the rose effect.

'Crimson Beauty'.—Grade A; Ludwig. Neyron rose 623. Tubular but well balanced tepal formation. Medium in size. Is a delicate color with veining and fine lines. Minimal green. This one is especially attractive if left by itself.

'Bouquet'.—Grade B; Ludwig. Azalea pink, between 618/1 and 618. A clear salmon being much deeper in the throat than distally. Even though this is a tubular type it has plenty of grace. Because of its weak color, if displayed near more gaudy blooms it will go unnoticed. Though single blooms will please those who like this shade of salmon, it would be very outstanding with a clump of bulbs all in bloom at the same time to make a good show. For those of you in California who can leave hybrid amaryllis in the ground out of doors, it is a good trick to let a bulb multiply unmolested in the same spot for several years to gain this effect. It can also be produced in an oversized pot so that roots are not lost by the annual repotting procedure.

'Moreno'.—Warmenhoven; Grade B. Geranium Lake, 20/3, distally and 20/2 in the throat. Tubular, fairly clear anteriorly with stripes on the keel posteriorly running lengthwise of the tepals. Very pretty!

'Fidelity'.—Grade AA; Ludwigs. Porcelain rose 620/2. Very wide tepals but medium in size. Flat face. Apple green in throat. The green does not detract but enhances the effect.

'Violetta'.—Grade A; Warmenhoven. The center is geranium lake, 20/3, and the outer 20/1. Stippled short stubby stripes at the center of tepals about two inches long and ¼ inch wide. Extremely large tepals which are so gigantic that in time they have to recurve. The buds before opening are rose madder 23 on the posterior surface of tepals which actually gives a soft violet appearance until the bud opens when the effect vanishes. Undoubtedly this is the closest yet observed here that begins to approach the violet shades.

LIGHT REDS

'Caruso'.—Ludwig; Grade A plus. Two scapes of three blooms each. Both the anterior and posterior tepals were nearly round in shape. Very small ears in the throat. Perfectly clear anteriorly with exquisite veining. Mandarin red 17/1. Very flat face and short tube.

'Invincible'.—Grade A plus. Capsicum red 715. Perfectly clear with no adulterant color posteriorly. Wide face. No ears. Two scapes of four blooms each. A warm appearance.

'Faust'.—Meeuwen; Grade A plus. Dutch vermillion 717/1. Large flat face. Perfectly clear both anteriorly and posteriorly with no green or yellow adulterant. The posterior petals are uniformly nearly round and large whereas the anterior tepals are smaller by contrast. Small petaloids in the throat mark this as a characteristically van Meeuwen flower and endear it to this observer. Two scapes of three blooms each.

'Garibaldi'.—van Meeuwen; Grade B. Vermilion 18/1. Petaloids present. Small flowers being very wavy and recurved. Very clear anteriorly. Two scapes of four blooms each. This one is expected to do better next season on a better root growth.

'Red Emperor'.—Grade A plus. Perhaps this one should be graded a double A since it is so very bright and such a beautiful shaped flower. The tepals tend to be wavy but are extremely broad. The little petaloids in the throat vary in size, shape and length and often twist on themselves, a delightful effect. Very heavy substance to tepals seems to hold up well unless in the very hot temperatures when this produces a floppy effect. At the very tip of each of the tepals there is a bead of near white that is novel.

'Dido'.—van Meeuwen; Grade B. Capsicum red 715/2. The yellow stripes in the center detract from the appearance but it is otherwise good.

'Champion's Reward'.—van Meeuwen; Grade B. Center blood red 820/1 blending to lighter Dutch vermillion 717 at the outer edge. Clear except for yellow streaks in minimal amount at the center. A small bulb did not produce a big flower.

'Goliath'.—van Meeuwen; Grade A. Vermillion 18. This has an amazing ability to reflect light resulting in a glossy bright sheen. The anterior is a self clear color deepening in the throat. Posteriorly an interesting contrast is gained by irregular veining of pastel green just at the distal portion.

'American Express'.—Grade AA; Ludwig. Make no mistake about it. This is one of the best reds that can be found. Very flat, wide, round and brilliant in its ability to reflect sunlight. Scarlet 19. Very clear this year both on anterior and posterior aspects with deeper shading in throat. No ears or petaloids may be the reason this flower looks so big when it measures no bigger than the rest. Very velvety texture and good substance to tepals.

'Gondibar'.—van Meeuwen; Grade B minus. Scarlet 19. Very pretty. Tepals narrower than the typical van Meeuwen. Veining is prominent.

'Halley'.—Ludwig; Grade AA. Poppy red between RHS 16/1 and 16 with a deeper throat shading. No adulterant color of green, yellow or other to be found. This form leaves little to be desired in this type of flower. Two scapes bloomed simultaneously, one with three and one with four blooms giving a spectacular effect.

'Cherokee'.—Warmenhoven Grade A plus. Very, very good. A shade darker than Scarlet 19.

'Scarlet Triumph'.—Warmenhoven; Grade AA. This is without the least doubt the best of the Warmenhoven reds. An extremely large, flat faced and clear bright red. The name is appropriate and perhaps the triumph part should apply to the breeder.

'Red Master'.—Warmenhoven; Grade B minus. Brick red 016 on the Royal Horticultural Colour Chart. Almost a Burnt Orange 014. This was a light dull red that gave one the impression of some of the finishes on cordovan leather in furniture table covers. Of seven bulbs obtained directly from Holland without any intermediate handling to make errors from the producer these reds were of this uniform color. Since Thomas Manley described these as deep wine reds, his were obviously not clones of these bulbs received directly from Warmenhoven's representative. At first it was felt that the Red Master of Warmenhoven was only a name for a class of reds rather than clones. This has been refuted, however, but it is the second time that this writer has met up with this experience on ordering several Red Masters of Warmenhoven's. A bulb of Red Master given to me by a personal friend in Florida did turn out to be a deep blood red 420 with current red 821 deep in the throat. The bulb received from my friend had a Grade AA bloom but it still did not come up to the deep red of 'Alcyone' or 'Franklin D. Roosevelt.'

DARK REDS

'Franklin D. Roosevelt'.—Grade AA; Ludwigs. Two scapes of two blooms each. Extremely flat with short tube. Current red 821 centrally where it deepened to a blood red 820 distally. Glows in the light. Small petaloids present. This and 'Alcyone' were the very best of the deep reds.

'Alcyone'.—van Meeuwen; Grade AA. Blood Red 820 in throat and 820/2 on face of petals. Slightly wavy with tendency to crenation of petal margins. Crinkled petaloid ears twist together.

'Superba'.—van Meeuwen; Grade AA. Another of the very finest deep reds that is so dark that to get any more so would spoil it. The darkest red that was observed was Mr. Rice's 'Zulu' but it is nearly black and thereby loses its attractiveness.

'Ludwig's Scarlet'.—Grade A plus. Signal red 719, to blood red 820/2 deep in the throat. Fine minimal stripes in throat did not mar this one. It reflects light a bit better than usual.

'Giant Goliath'.—van Meeuwen; Grade AA. Vermillion 18. Like Hollywood's term "Super-Colossal" this one had no trouble in living up to its name with its very wide face and short tepaltube. The face was nine inches and each tepal was 4½ inches across posteriorily. In spite of the heavy tepal substance it did not droop or flop. The ears were smaller in size than usual.

'Royal Ruby'.—Warmenhoven; Grade A. Large scarlet 19 with good substance and heavily veined.

Let it be restated that this grading is a matter of pure personal opinion and was done for the pleasure of it. There is not a single bloom that can be called ugly. They are all so beautiful that one wonders just how far enthusiasm can go. It should be mentioned here that there are miniature striata varieties available again though not in clones as yet. The beautiful ''Graceful'' strain of van Meeuwen's disappeared from the market. Ludwig has a strain called ''Gracilis'' that abounds in scarlets, light and deep reds and red and white varieties. It is possible that in the future these may be obtained in the colors desired though they are not at this time so represented. Perhaps they can be obtained in the coming season and once seen the miniatures can be appreciated for what they are.

MY EXPERIENCE WITH AMARYLLIS

Mrs. Joseph Elias, *Connecticut*

On March 3, 1948, when I obtained my first Dutch Hybrid Amaryllis, I never realized how interested I would become in this group of plants. On the 14th of May of that year two of the largest, loveliest, deep red flowers opened, and that started me off! Today, eight years later, I have about 200 blooming size potted Amaryllis and several hundred smaller bulbs, in addition to a new crop of spring sown bulblets ready for their first transplanting. The first season is the only one in which I keep the plants growing throughout the year.

To make the task of caring for them as simple as possible, I pot up in the fall only those bulbs which either have bloomed, or have grown to possible blooming size during the summer. These are potted in screened compost, lightened with sand, with some bonemeal added. Others are dug up, put into flats and kept in a warm dry cellar until the following spring. For two years these smaller bulbs have been stored in soil, but this year I've put some away in vermiculite, and others without any covering.

The larger potted bulbs are allowed to dry off for about three months, with only a watering about once a month. After the first of the year they are gradually brought up to the living rooms for growth. First they are given a thorough soaking, then I wait for signs of active growth, after which watering is increased as the leaves develop.

When remodeling our house last year, we put in special storage cabinets under the living room windows with 18″ wide counter tops for potted plants. We took into consideration the brilliant colors of the blooms and finished the walls in a soft green, with knotty pine paneling. Early this year we had approximately 50 blooming plants in our front window, and with a heavy fall of snow outside, these brilliant blooms visible through the window frequently stopped traffic.

I select a few special plants for pollinating each year, looking especially for clarity of color and possible fragrance. To continue good leaf growth after flowering, I feed liquid plant food about every three weeks until May, when the plants are set out into the open ground for the summer. Aside from an occasional watering in very dry weather, and pulling the few weeds that come up through the mulch of grass clippings, no further work is done until the frost threatens in the fall. This year the plants grew outdoors until the end of September.

A gardening friend, Mrs. Leo Miller, Sr., tells me that some years ago she and her late husband grew the bulbs in a 20 foot row for summer blooming in the garden. In the fall these were brought indoors and treated as other summer blooming bulbs for winter storage.

I have started a collection of species Amaryllis and other amaryllids which at present is limited to the following list: *Crinum* 'Cecil Houdyshel', *Agapanthus africanus, Clivia miniata, Lycoris squamigera, Hymenocallis narcissiflora, Amaryllis elegans* var. *ambigua, A. striata* var. *fulgida, A. belladonna, A.* x *Johnsonii, A. psittacina, A. belladonna* var. *plena (albertii), A. striata* (type), *Rhodophiala bifida* (oxblood-red), and *R. bifida* var. *spathacea.*

WHAT AMARYLLIS MEAN TO ME

MRS. E. C. HARDING, *Anahuac, Texas*

What does Amaryllis mean to me?—breath-taking beauty. It is early April. I just came from a walk in the yard. The Amaryllis blooms are simply out of this world! Many are seedlings blooming for the second and third times. I wish I knew more about Amaryllis so I could detect the strains in my seedling flowers. Thus, Amaryllis means research and study to me, also.

I have a few ''red lilies'', inherited from Grandmother, just the common *Amaryllis* with which the average gardens about town are content with. To them the name ''Amaryllis'' is this ''red lily''—admired, enjoyed, but nothing to get excited over! I enjoyed my clump and still do. They are dainty and bright and bring remembrance of a happy childhood and a beloved Grandmother!

I suppose to this day I would be content with this old fashion clump but for a gift. In 1948 a flower pal of Louisiana sent me two bulbs of a hybrid red amaryllis, a batch of seedlings ready to bloom the following year, and some seed to plant.

Amaryllis took on new meaning, new size, greater beauty—a new world opened up before me—that of the hybrid Amaryllis. In 1950, I was so pleased with my ''start'' I begged or bought many amaryllis seeds from flower pals over the United States. A few had bulbs of named strains so I grew some that produce lovely flowers.

When my seedlings began to bloom, I felt that several ranked among the very best. Last Spring I saved my own seed to plant. I still need a good pink and a white-flowered clone. I plan to purchase these two bulbs and continue to build up a large bed by doing my own crossing.

I already have various shades of red, oranges, and salmons; solids and stripes; large (to me), moderate, and small flowers. During the past winter, a native of Oklahoman loaned me some of his flower slides for study, including a few slides of hybrid Amaryllis. Then I saw Amaryllis at their glorious best! How much more I must improve my strain before I achieve such a goal! This year I am ordering seeds of the Dutch and American strains, and a few Ludwig strain Holland grown pinks. In the next few years I expect to see flowers of a size, shape and color new to me. If these prove to be hardy here I plan to buy named clones as the years pass by.

We live in a mild climate where the ground seldom freezes. The Amaryllis we have, have wintered in beds in the yard without a single loss. We prepare deep beds and mulch well with leaf mold. We use bone meal and old barn yard fertilizer in early spring and again in the summer. The number of flowers we have obtained, and their loveliness prove that we are not far wrong with methods of culture. Each year since I became aware, Amaryllis have achieved new meaning to me! Today, they mean an unexplored horizon of a superb group of plants whose beauty I am yet to fully realize.

MY WAY WITH AMARYLLIS

Mrs. Emily B. Jefferies, *Florida*
Horticulture Chairman, Orlando Garden Club

It is early September, and there is a hint of fall in the air and the squirrels in the hickory tree are having a feast on the ripe nuts and dropping the shells on anyone passing below. With the ripening of the hickory nuts I know it is time to get out and start to uncover the Amaryllis beds from their summer blanket of weeds, camphor, cherry laurel and oak seedlings, all standing six to eight inches high. No hoeing or grubbing here, this must all be done by hand. As each handful is pulled I give it a sharp shake to dislodge the dirt clinging to the roots and lay the weeds in handfuls between the rows of Amaryllis. Our soil here in Central Florida is very sandy and, as all plant food leaches out very quickly, it must be constantly enriched with humus and leaf mold so I throw nothing away in the way of plant food. The weeds are given several days to dry out and the beds are then given a top-dressing of ''Mil-organite,'' castor pumace and bone meal and the sprinklers turned on and let run over the beds for several hours.

The Amaryllis bed is situated on the west side of the house, making a rough rectangle of about 15 by 50 feet, interspersed here and there with Hibiscus and Camellia bushes. The bed gets the full morning sun and is shaded in the afternoon by a large camphor tree and a hickory tree. The soil of the bed is very loose and porous and rich in humus and leaf mold, and as I pull weeds I cannot keep from marveling at how the bulbs have grown during the summer. Last year's seedlings are about an inch in diameter and the larger bulbs seem to have grown in proportion.

The bed is never allowed to dry out, getting a good watering two or three times a week and oftener in the summer and early spring if it is needed. When the hickory leaves start falling, I mulch the beds heavily with the leaves and mulch again in the spring when the oaks start to shed their leaves.

If we have frost during the winter the tops of the Amaryllis may be killed back, but I have never found (after 20 years) that the bulbs were injured in any way, often blooming out of the bare bulb in the spring with three, four and even five scapes, each having from 3 to 5 large flowers to each stalk.

The beds are kept weeded during the winter until after flowering in the spring, when they are again given a good feeding of ''Mil-organite,'' castor pomace and bone meal, mixing it well into the soil.

The beds are allowed to grow up in weeds during the summer as I think this helps to shade the bulbs and keep them cool and damp during the hot, dry weather.

Sometimes as I weed, I find a bulb that has sunk below three quarters of the depth of the bulb; if so, I pull it up and reset it, as for some reason the Amaryllis do not seem to bloom as well and form as large a bulb if allowed to sink below the neck of the bulb.

A few of the bulbs in the beds are Mead strain, having been given to us by the late T. L. Mead. Mr. John Springer gave us a few more and, from then on, we had the Amaryllis fever. Later on, a few seeds of Dutch hybrids were imported from Holland along with several bulbs of named varieties. A few more bulbs from Mr. Wyndham Hayward's collection were added later. All of these bulbs, the originals as well as the later additions and the various crosses are growing together under the same conditions and all seem to do equally well. The Dutch bulbs as well as the Mead bulbs grow, thrive and large, beautiful flowers each year.

Now that the work of weeding is over, it is with a wonderful sense of accomplishment that I survey the large fat bulbs and visualize the wonderful display of bloom and color in the Spring. It is at this time that visions of blue ribbons at the ''Spring Bulb Show'' begin to dance in my head. Which ones shall I take up and put in pots? I always have a hard time deciding this,—the largest bulbs or some of the new seedlings?

To make sure of having enough Amaryllis in bloom at the right time, I always pot up at least twice as many as I think I will want to enter in the show, because so far I have not found any way to force Amaryllis to bloom at a stated time. If anyone ever does find a sure-fire method of forcing Amaryllis, I will be glad to know about it.

For show purposes, I try to select the best bulbs in the bed, as free from blemishes as possible. The larger bulbs go into twelve and fourteen-inch pots, 2½ to 3-inch bulbs are put into eight and ten-inch pots.

After I have selected the bulb and the pot to go with it, a layer of osmunda fibre is put in the bottom of the pot to take care of the drainage, a layer of compost is added and wetted thoroughly. I then either lift the bulb with soil intact and fill in any space left in the pot with compost, washing the dirt down around the bulb, making sure any air space left between the roots of the bulb is filled with soil. As I work, I pull the bulb toward the top so that at least three-quarters of the bulb is above the soil level.

Sometimes I plant the bulbs bare rooted, taking them from the beds with as many roots left on as possible. The potting is started then in the same way, a layer of osmunda fibre, then a layer of compost. The roots of the Amaryllis are then arranged in the pot, adding compost and leaf mold a little at a time, watering well after each addition, making sure that open spaces and air pockets between the roots are filled with dirt until the soil is within one-half inch of the top of the pot, and the base of the bulb is just under the soil level. This last method takes more time and I have not noticed any difference in growth or bloom habit between the two methods.

If the bulbs are potted in the fall, by March the pots will be so filled with roots that they will be showing on top of the soil and even over the rims in some cases.

I keep the pots well watered at all times, never allowing them to dry out. A little liquid fertilizer may be fed about once every six weeks but if the compost was rich and loamy they should need very little fertilizer of any kind until they are set back in the beds after blooming in the Spring.

Last year at show time I took up blooming plants, placed them in pots and cans, watered them well and, wonder of wonders, got blue ribbons on them. The foliage did not wilt nor did the flowers droop. The day after the show they were set back in the holes they had come from. They went right on growing, not seeming to mind having been moved. I wonder if I can do as well this year? I'm going to try.

DISCOVERING AMARYLLIS

Gerald Carsley, *Ontario, Canada*

One day, five years ago in Toronto, while glancing through a flower catalog, I saw it. It was a photograph of an *Amaryllis,* and I decided then and there not only to order some, but to try to find out as much about them as I could. Later on when the bulbs came and were planted, I was presented with a bouquet of eight glittering white blossoms to each bulb, scented sweetly, but very faintly. The Amaryllis leaves little to be desired as a complete plant. Bulbs, scapes, leaves, blossoms, are all blended together in design to produce a symphony of beauty.

Later on from Ludwig & Co., I ordered a pure white Amaryllis named 'Ludwig's Dazzler'. I remember the first impression it fixed in my mind. When the sheath opened, the four exposed buds looked more beautiful than most flowers, for they looked in appearance like silk—white silk. And the final blossom was such a dazzling white, that any other white article had a tinge of cream when held beside it. As a matter of fact it looked so beautiful that I had to touch it to prove to myself that it was real. In Holland, Ludwig & Co. have had specimens of this particular variety that were eleven inches in diameter. To support my studying I worked in the summer at Banff, where I carted with me a bulb to keep me company. There it flourished in a greenhouse at 5,000 feet above sea level 2,000 miles away from the previous location. Here one could see and discover a lot by just observing. For instance the humidity and even temperature caused the width of the leaves to grow between two and one half to three inches, and also caused it to bloom three times a year. What astounded me was the fact that under these conditions, there was exhumed from its petals a most ethereally sweet perfume. It seems that one should worry more about the quality of the Amaryllis leaves, and look for more width rather than length for maximum health. We found that a bulb really rests from the time when the outer two or four leaves mature, so that with some bulbs it's worth while to leave the leaves on. The Amaryllis, like you and I, is an individual, and so if a result is to be obtained, an action must be produced. For, if the leaves are left on, the bulbs rarely shrink, but watering should be decreased at various intervals. There doesn't seem to be a set rule for potting mixture formulae, but as long as the medium is a heavy, aerated type, you are safe. Since my Amaryllis was doing so well at Banff, I decided it deserved a better home than I could give it, so there it is, and there it still remains. There is also at Banff in a lady's possession an Amaryllis species which has ten blossoms on one scape, each three inches wide: in colouring it is an apricot pink with a cream throat. It was bought by the present owner while she was in Mexico, from a traveller. Its origin is a mystery, but the perfume possessed by it is intensely spicy.

I find it fun to train the leaves on Amaryllis to approach as close as possible the leaves of a Clivia. This plus a stalk in bloom presents something a little different. Speaking of something different, one day two years ago when one of my Amaryllis bloomed, a most unusual surprise presented itself—one of my blossoms had ten petals, eleven stamens, and two pistils. The texture of this flower was a smooth glass-like silk, while the other three were a rich red velvet in appearance with one of the three being different than the other two by having seven stamens, and the normal one pistil. Of course all three had had six petals and as mentioned before, the one pistil each. I am told that this phenomenon happens occasionally but the condition is not hereditary.

Upon examining Amaryllis, I noticed that the entire system of growth is a product of a triangle and a hexagon. It has six petals, six anthers, the stigma is split in three, the stalk which is oval appears like a rough hexagon, and the stalk, when cut and examined show that the cells are a clear cut hexagon in shape. The seed pod has a hexagon shape when cut at right angles to the length of it. Also the seed pod has a hexagonal shape in the secondary covering to which the seeds adhere. The seed pod also has three air pockets and the seeds are present in three groups of two. The anthers are triangular. Even the veins in the petals form both patterns running crosswise to triangular parallel veins, roughly shaped like a triangle and a hexagon. So it appears that metaphorically speaking these plants are living crystals.

FORCING HYBRID AMARYLLIS

JOSEPH C. SMITH, *M.D., California*

The object in this experiment was to have a Dutch hybrid amaryllis in bloom for Thanksgiving 1956. 'Red Master' was chosen as the variety to be used, and the preparations were begun approximately five months ahead of the anticipated date of bloom. A bit of the history of this bulb should be given as a background to the description of the present performance.

It was purchased from the bulb importer in November 1955 and potted up December 1st. It immediately started activity by sending up a scape with two beautiful florets which opened seven weeks later in the last week of January. Seed were set and these were mature and harvested the first week of March. The leaves which appeared along with the scape were kept growing, and weekly feeding with a chemical fertilizer was given. The plant was kept indoors at 70 to 80 degrees F. until March 21st when it was warm enough to transfer it from the pot to the open bed in the lath house. There was a solid ball of roots and soil, and the plant was merely dislodged from the pot and set in the ground intact. Growth continued luxuriously until the middle of June when it stopped sending up new leaves and seemed to want a rest. There were ten leaves thirty to forty inches long.

On July 1st the leaves were cut off six inches above the bulb and the bulb lifted from the ground. The original diameter of the bulb had been exceeded slightly. It was placed under a large clay pot to dry for a couple of weeks and then stored in a large oatmeal box packed with dry peat moss. The box was placed where it received full sunshine each day. Here it remained until September 10th. when it was potted up in hopes it would bloom by Thanksgiving, November 22nd. Some extra time was allowed because the nights are cool at this season of the year and it would probably require a little longer than average to bloom.

However, nature played a trick and gave a week of unusual heat two days of which broke heat records for early November by going to 96 degrees. As a result the scape matured rapidly, and since cold storage was not resorted to the flowers opened on November 12th, ten days ahead of schedule. There were no leaves with the first scape. The tip of the second scape and the leaves were just showing at the time the first scape was in full bloom. The first scape was shorter than normal and the flower size smaller than the standard for 'Red Master'. This could be due to the fact that the heat and drying in the storage process destroyed most of the roots. Red master forms new roots readily and the second scape was normal in size and height, the bulb separating from the pot with a solid soil ball at that time.

'Red Master' has been described as temperamental in behavior but this bulb has proven quite flexible so long as it is given plenty of heat, food and water. The potting soil used was one part good loam, one part sand, one part oak leaf mold with a liberal supply of bone meal added. While the plant was potted up a chemical fertilizer was added, and while in the soil a top dressing of composted manure was used.

Ample growth must be obtained before allowing a bulb to go dormant. This means at least four pairs of leaves are produced since the last flowering. This bulb was flowered less than ten weeks after the last previous bloom, and it is hoped to move it up again in the future, eventually holding its flowering time at near the mid off-season. It would seem that hybrid amaryllis can be brought into flower at any time following sufficient growth by forcing them into a warm dormant period of at least ten weeks duration.

CULTURE OF **SPREKELIA FORMOSISSIMA**

Mrs. B. E. Seale, *Dallas, Texas*

Sprekelia formosissima of the Tribe Zephyrantheae is a cousin of Amaryllis. It is also known as the Aztec Lily, Jacobean Lily and the St. James Lily. The botanical name Sprekelia formosissima was given to the plant in honor of the German botanist, J. H. von Sprekelen.

It is native to Mexico and South America. Quantities of them were seen in Peru by the early Spanish explorers and the color reminded them of the color worn by the Knights of St. James, so they called them the St. James Lily. These explorers took some of the bulbs back to Spain and from there they spread and were cultivated over the continent. They have been grown in England since 1658, however, they are little known or grown in American gardens.

Sprekelia is a sturdy bulb, and may be planted in the garden in early Spring and to the middle of May. It is quite rewarding as a spring and summer flowering plant.

The bulbs are planted five inches deep in rich sandy loam; they do not grow well in heavy soil. A cushion of sand is placed at the bottom of the hole where the bulb is set, after mixing ½ cup of bone meal in the soil under the cushion of sand. Good drainage should be provided, and also an abundance of water all of the time that the foliage is green. They are gross feeders and should be fed a good balanced fertilizer every month during the growing season.

Sprekelia grows best in full sun, but will tolerate partial shade. They bloom in a few weeks after planting. They grow very readily from seeds, and to secure a good heavy crop of seeds, the flowers should be hand-pollinated.

They are easily grown in the house, if placed in a sunny window; they may be grown in pebbles or fiber in a hyacinth jar with water. In the spring the house-grown plants may be transferred to the garden—putting them in the ground or leaving them in the pot. If left in the pot, remove the top soil from the pot and fill in fresh soil, water and put in a protected place, on the north side of the house for a few days to keep them from wilting.

When the bulbs are planted in the garden and lifted in the fall; bulbs that are carefully lifted, dried, stored in sand, sawdust, peat-moss or vermiculite over winter, may be planted again next spring in the garden. However, they may be left in the ground all winter in Southern States. They are hardy as far north as Washington, D. C.

They multiply very rapidly, forming fine clumps with many offset bulbs around the parent bulb. They are divided—in fall or early spring—only when the clumps seem to be very crowded, which is usually in three or four years.

The foliage is similar to *Habranthus* foliage; green and strap-like. The plants grow about 14 to 18 inches tall, depending upon location, proper planting, feeding, watering and general care.

The curious fleur-de-lis-like flowers are a rich velvety crimson or brilliant scarlet color. They are almost shaped like a butterfly and resemble a butterfly in flight, even suggestive of Cattelya orchids; they are ''Tailored Flowers'' with a sculptured look. They may be used as a corsage, in fact sometimes, they are referred to as the ''RED ORCHID''. They are most exotic when made into any type of corsage and arouse a bit of interest and comment when so used, whether with formal or informal costume.

A beautiful arrangement of *Sprekelia* blossoms was exhibited at a Flower Show in Dallas last Spring. It was most unusual and received much attention and several awards. It provoked much questioning by those who attended the Show, especially those who desire to grow them. Besides the enjoyment of the brilliant splash of red color in the garden when *Sprekelia* is in bloom, there is the accent of fresh green foliage in the garden after the blooming season is over. Do plant some of these exotic plants and they will reward you for your ''Garden Hospitality.''

SOME NEW HYBRID HEMEROCALLIS

George Gilmer, *Virginia*

I have two decidedly interesting novelties: (1) 'Quartet' by Milliken. Its flowers have eight tepalsegs instead of the customary six. I have only had it bloom on a small plant, but it looks like it will be good even without the novelty of the extra tepalsegs. (2) I bought 'Tuday' as a forty-eight hour bloomer. The first year its flower did not last forty-eight hours. This year they are open as early as I have gone into my garden, and have been open at the close of the second day. It is very fragrant and blooms twice. Except for the durability of its flowers I wouldn't keep it. It should be worthwhile for breeding.

Armstrong & Bemer's 'Howdy' is the most eye-catching bi-color daylily I know. Quinn Buck's 'Anne Dodson' is a fine pastel predominantly yellow. His 'Gold Antique' is one of my favorites. It has wide petals. 'Miss Arcadia' has rather small yellow flowers and good quality and blooms freely through August and early September.

Tom Craig's 'Valesca' is a fine late yellow for a very attractive and slightly different color. His 'Wonder' and 'Wide-Eyed' are eye patterns that bloom three times here. They are not one hundred per cent sunfast everyday.

Charles W. Culpeper's 'Addred' is a brilliant late mid-season red freely produced. Howard M. Hill's 'Harriet Hill' is one of the brownest. I like his 'Deep Velvet'—a dark red with some brown. His 'Bright' is an August blooming rose. J. E. Bass's 'Bright Taylor' is a new outstanding brilliant red. E. J. Kraus's 'Aten' is the purest and brightest orange. 'August Pink' is a late blooming deep rose. 'Autumn Daffodil' is a small yellow, late and free flowering. 'Double Value' is perhaps the best double. 'Margaret Fuller' is large and unexcelled as a late yellow. 'Neyron Rose' is large and I know of no better rose. 'Ringlets' is a fine small yellow.

Mrs. Hugh W. Lester's 'Black Friar' is my finest dark red. 'Fairy Wings' and 'Sweet Mystery' are lovely blends predominantly yellow. 'Port Royal' is a red, distinctly different in color from any other I know. 'Gene Wild' is a fine really yellow blend. 'Picture' is a fine rose pink.

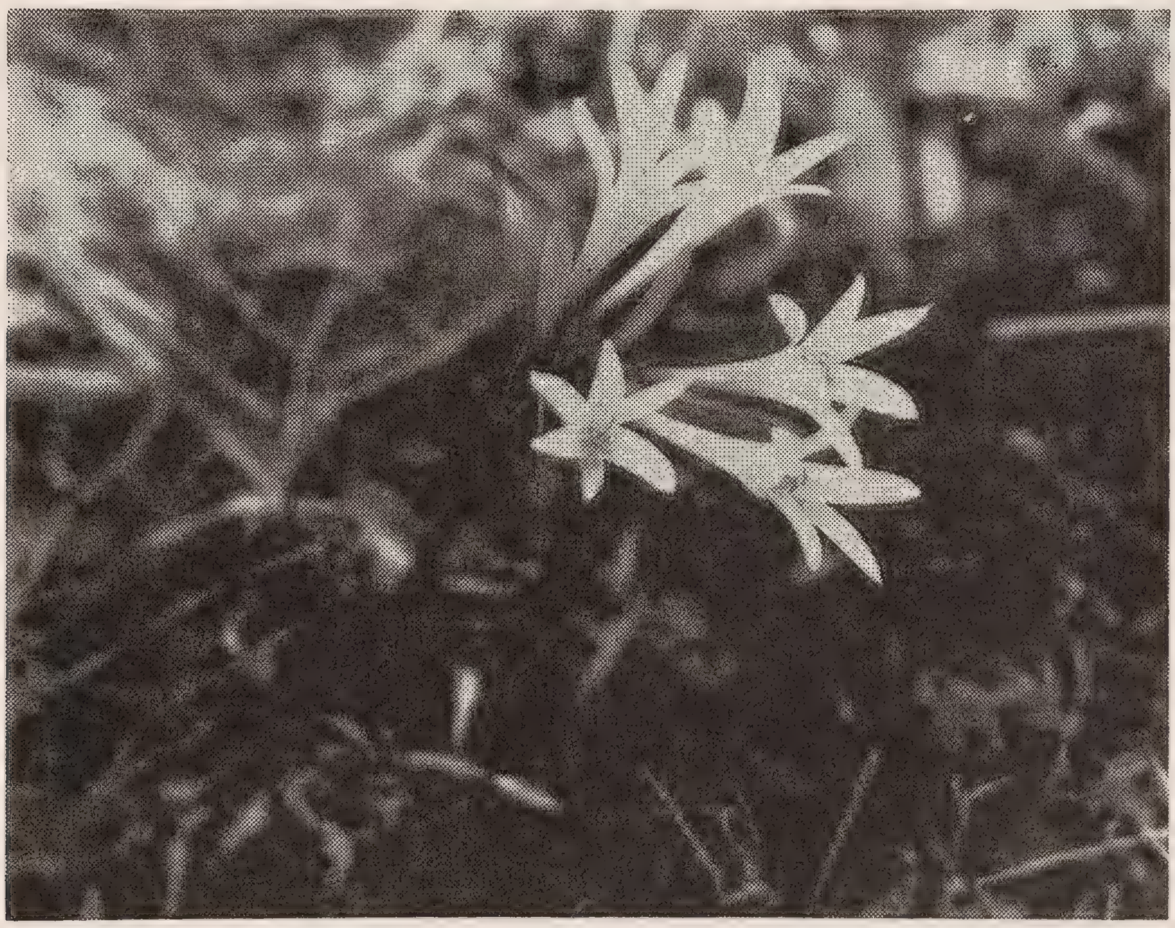


Fig. 31. *Ammocharis tinneana* (Kotschy et Peyritsch) Milne-Redhead et Schweickerdt. Photo by L. S. Hannibal.

D. R. McKeithan's 'Oklahoma' is a later and better 'Painted Lady'. Milliken's 'Brass Band' and 'Hazel Saunders' are excellent repeaters. 'Cosette', 'Gold Strike' and 'Fond Caress' are all very good. His 'Black Absolute' is the darkest red I know. H. M. Russell's 'Captain Russell' is the loveliest bi-color I know—lavender and light yellow. 'Mrs. H. M. Russell', 'Jake Russell', 'Marsha Russell' and 'Bette Russell' and 'Helen Hull' are all top quality.

Sass's 'Jessie Shambaugh' has pink edging distinctively different in pattern. 'Buttercup Lane', 'Capitol Dome' and 'Butter-scotch' are all tops. Mrs. Taylor's 'Golden Dewdrop' is the finest miniature I've seen. It blooms three times for me. 'Adelaide Neiland' and 'Quincy' are fine lavender blends. 'Citation' is an excellent color red. 'Norma Borland' is a very attractive brownish yellow. 'Whitfield Palmer' is a fine large yellow. Watch for Taylor's 4235—a lovely light pink.

AMMOCHARIS TINNEANA

L. S. HANNIBAL, *California*

This bulb was received from the late Miss Stanford along with *Brunsvigia* species. It was in the garden some ten years before it decided to flower. Until it threw the second summer scape, which is typical of the *Ammocharis* (and *Crinum),* the writer was particularly puzzled as to its identity. However, upon consulting Milne-Redhead & Schweickerdt's report in the Journal of the Linnean Society (P. 159-197, 1939) the unanticipated identity was at once apparent.

Ammocharis tinneana [Fig. 31] has a wide distribution through south and central Africa, and obviously considerable variability can be anticipated. This clone has pale pink blossoms which appear in September, and the foliage appears in winter. It is definitely quite hardy here at Fair Oaks, and apparently has several offsets developing. Most *Ammocharis* are not so hardy this far north, and rarely if ever produce offsets. I would presume the bulb well adapted to the southern California climate. Seed was not obtained here, but should be obtained under milder temperature conditions.

CULTURE OF CRINUM AMERICANUM

Crinum americanum L., the type of the genus *Crinum,* grows by the millions in the Everglades of Florida, and also elsewhere in Florida through coastal Alabama, Mississippi, Louisiana, and Texas. Up to the present it has not been extensively cultivated which is apparently due to lack of information about its culture.

1. OUTDOOR CULTURE IN CALIFORNIA

Crinum Americanum requires a moist sunny location where it can root deeply. By withholding water during July and August, then soaking heavily, blooms can be had in mid September or early October [Fig. 32]. Seed set readily but are slow to grow unless given a great deal of root room. A five gallon paint pail is the smallest size of 'pot' recommended.—*L. S. Hannibal*

2. POT CULTURE INDOORS AND OUTDOORS

The writer has had experience in growing *Crinum americanum* under pot culture, first at Beltsville, Maryland, and later at Arcadia and La Jolla, California.

At Beltsville, the plants were grown, 3 bulbs per 6-inch pot, with an over large drainage saucer beneath the pot. The saucer was kept filled with water during the growing season. The plants, in the regular amaryllis potting medium, were given a complete fertilizer such as Vigoro, a tablespoonful for each 6-inch pot, every 6 weeks during the growing season. Under these conditions the plants flowered regularly. During the winter resting season, the saucers were removed and water was applied sparingly, and fertilizer was omitted. Under similar culture in the greenhouse at Arcadia, California, the plants flowered regularly.

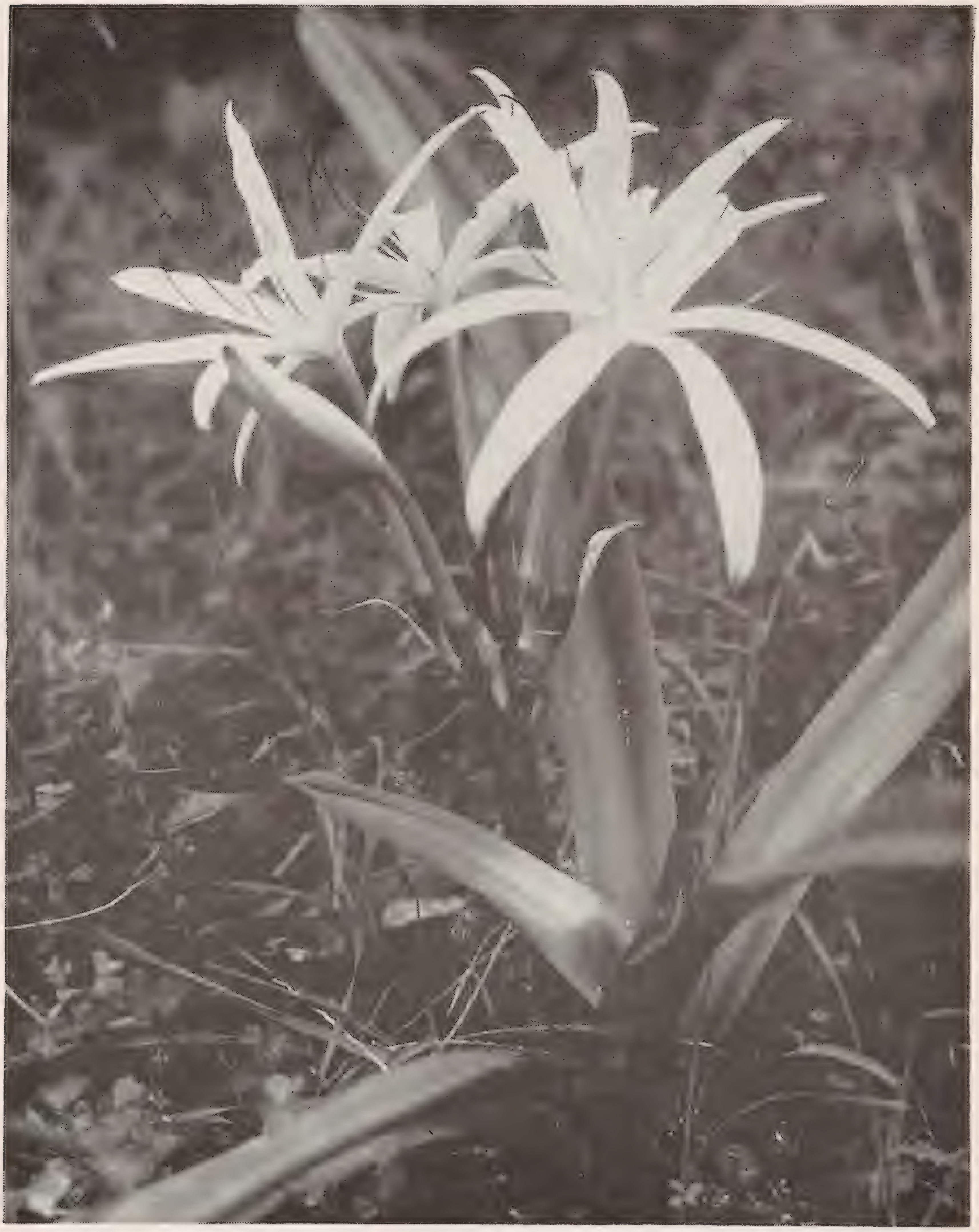


Fig. 32. *Crinum americanum* L., as grown at Fair Oaks, Calif. Photo by L. S. Hannibal.

At La Jolla, Calif., outdoor culture was first attempted with poor results due to the low natural rainfall, and failure to supply water abundantly. The bulbs have now been potted and are doing very well.—*Hamilton P. Traub*

3. AQUARIUM CULTURE IN CALIFORNIA

Some aquarium dealers in California sell *Crinum americanum* as a pool plant, but the writer has not had time to check on the cultural methods employed. Perhaps some of the readers have used it for this purpose. Reports on this type of culture will be welcomed for publication in HERBERTIA.—*Hamilton P. Traub*

[PLANT LIFE LIBRARY—continued from page 100.]

INTRODUCTORY ORGANIC CHEMISTRY; WITH CERTAIN CHAPTERS ON BIOCHEMISTRY, by E. Wertheim, and H. Jeskey. 3rd. ed. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 1956. Pp. 476. Illus. $5.50. The purpose of this revised edition of a standard text is to equip students of home economics, veterinary science, nutrition, pre-medicine, dentistry and pharmacy with a foundation in organic chemistry. Highly recommended.

SUCCULENT PLANTS, by H. Jacobsen. English ed., translated by Vera Higgins. John de Graff, Inc., 31 East 10th St., New York 3, N. Y. 1955. Pp. 293. Illus. $9.00. This is the standard book on succulents, now available in an English edition. It lists 151 genera and 1,078 species which include most of the succulents, except cacti, met with in cultivation at present. The characters of each plant are enumerated for purposes of identification. Brief cultural notes for the genera are included. A must for all interested in succulents.

THE CULTIVATION OF SUCCULENTS, by H. Jacobsen. English translation by Vera Higgins. John de Graff, Inc., 31 East 10th St., New York 3, N. Y. 1955. Pp. 108. Illus. $2.50. The purpose of this book is to provide information about the chief genera of succulents that require special treatment for best results. Thus this book is a companion volume to Dr. Jacobsen's larger one, Succulent Plants, in which a larger number of species are included. Highly recommended.

THE MAGIC WORLD OF FLOWER ARRANGING, by M. J. Brooks, and M. A. & J. P. Roche. M. Barrows & Co., 425 4th Av., New York 16, N. Y. Pp. 192. Illus. $10.00. This lavishly and beautifully illustrated new book cannot be too highly praised. It emphasizes that the arrangements part of the flower show is an art exhibit. The three parts of the book each give detailed directions for a general theme of a flower show. In fact, each of the sub-themes of a general theme may furnish the theme for a show. It is rarely that one has the opportunity of reviewing such a book as this one which is without a fault. Highly recommended.

GERANIUMS; PELARGONIUMS FOR WINDOWS AND GARDENS. 3rd ed., by H. Van Pelt Wilson. M. Barrows & Co., 425 4th Av., New York 16, N. Y. 1957. Pp. 240. Illus. $4.50. This is the third revision of the standard American text on the subject. Historical notes, detailed cultural directions, suggestions for use in the home and garden, and descriptive lists of varieties are given in clear concise language. It is a must for the beginning and advanced grower of these charming plants.

HOW TO MAKE CUT FLOWERS LAST, by V. R. Kasperski. M. Barrows & Co., 425 4th Av., New York 16, N. Y. 1956. Pp. 191. Illus. $2.95. The author gives practical directions on extending the life, or usefulness of dead material, of a great variety of material used in bouquets and arrangements. The chapters are devoted to general directions, special treatments for groups, detailed directions for plants from *Acacia* through Zinnia, and drying, pressing, dyeing, forcing, and making potpourri.

THE NEW GREENHOUSE GARDENING FOR EVERYONE, by E. Chabot. M. Barrows & Co., 425 4th Av., New York 16, N. Y. 1955. Pp. 252. Illus. $4.75. This charming new book on greenhouse gardening from coldframes to the practical-purpose greenhouse, is by an outstanding authority. The culture of no less than 569 varieties of plants, including ornamentals, vegetables and fruits, is detailed in non-technical language. Highly recommended.

[PLANT LIFE LIBRARY—continued on page 4.]

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1957

GENERAL EDITION

EDITED BY

HAMILTON P. TRAUB

HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY

Box 150, La Jolla, California

PREFACE

This General Edition of Plant Life includes a number of interesting articles. Mr. James contributes a timely article on the Maidenhair tree which is being widely planted. Mr. Sayler tells how to grow *Achimenes* from seeds, and Dr. Smith reports on *Agave virginica.* Dr. Gertrude Earl contributes a valuable article on the chromosomes and speciation of the Calla Lily, *Zantedeschia.* There is a report on a hybrid *Zoysia,* a fine lawn grass for subtropical climates. The Plant Life Library—reviews of current books—completes the issue.

April 15, 1957,
5804 Camino de la Costa,
La Jolla, California.

Hamilton P. Traub
Harold N. Moldenke

DR. CORLISS GARDEN TOUR

Dr. Philip G. Corliss will conduct a Garden and Photography Tour of Europe, sailing Aug. 21 and returning Oct. 5, 1957. Those interested should write to Arnold Tours, 79 Newberry St., Boston 16, Mass.

DR. TRAUB'S "THE AMARYLLIS MANUAL"

The Macmillan Company, 60 Fifth Ave., New York 11, N. Y. announces that "The Amaryllis Manual" by Dr. Hamilton P. Traub will be published in June 1957. This is a complete book on Amaryllis including the history, parts of the plant, the cultivated species, the divisions of hybrid amaryllis, breeding, propagation, culture, control of pests, marketing, amaryllis shows, and amaryllis as a cultural asset. The appendices deal with nomenclature, the descriptions of the 46 *amaryllis* species, the amaryllis organizations, amaryllis dealers, and garden supply dealers.

P. S.—Since the above was written, word has been received that the publication date has been postponed for several months. However, copies will be available by December 1957, and at the very latest by January 1958.

THE MAIDENHAIR TREE, **GINKGO BILOBA**

W. McD. James, *California*

This tree, either as a single specimen, in a group of several, or in rows bordering along roadsides, presents a picture both when it is green in the summer or colored in the fall, that will last a long time in the memory of those who see it. The silver-green leaves change to a bright golden yellow almost over the whole tree at the same time, and they retain this color for awhile after they have fallen. At one time the tree was widely distributed over the world, but changing conditions caused it to die until probably the only living ones left were those cared for by man in private gardens and temple grounds in a comparatively limited geographic area. Because of its adaptability and attractiveness, man is gradually redistributing it over much of the world. *Ginkgo biloba* is probably one of the most interesting examples of a cultivated plant which recalls the very ancient past in a realistic way. It is a member of a genus which had several species of which all but one are now extinct.

The Sequoias are often called "living fossils", but fossil records of these trees go back only to the Tertiary period in the Cenozoic Era. *Ginkgo* fossils are found in the rocks of the Cretaceous period of the Mesozoic Era, which is up to sixty million years older. Two species from several of the Sequoias are still growing in a natural state, although they have been reduced to relatively small areas almost entirely in California from rather widely distributed places in the northern hemisphere.

It is doubtful if there are any of these *Ginkgo* trees growing in a natural state today. In 1899 Mrs. Bishop reports seeing fine specimens in the forests which surround the sources of the Gold River and the smaller Min River in western China. But there seems to be no record of any confirmation. Dr. Ernest Wilson, the plant explorer and botanist, spent some time searching Chinese records and had others help him, in an attempt to find some data on when and where these trees were last known to be growing in a natural state. But the only trees mentioned in even very ancient records were growing in private gardens or temple grounds. Apparently there are no data showing how long *Ginkgo* has been cultivated as a sacred free. The first one of these trees to reach Europe is said to have come to Holland from Japan in 1712. A tree was planted in what is now the Royal Botanic Gardens at Kew about 1762. This proved to be a staminate tree. Pistilate scions grafted to it bore fruit in 1919. Today *Ginkgo biloba* has world-wide cultivation even where winter temperatures occasionally reach twenty degrees F. below zero.

In European literature this tree was first mentioned by Kaempfer in 1712. His term "Ginkgo" was adopted by Linnaeus in his Mantissa Plantarum of 1771. In 1797 Smith referred it to the Coniferae, substituting the designation *Salisburia adiantifolia* for the "uncouth generic name *Ginkgo* and the incorrect specific term *biloba*".

Fossil remains from several million years ago (the Mesozoic) demon-

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starte both the antiquity and former wide geographical range of *Ginkgo biloba.* There are some petrified *Ginkgo* trees in the State of Washington, and fossils are found in several places in Washington, Idaho and other parts of the world. The similarity of these widely distributed fossils to those of extinct related forms caused bitter disagreement among taxonomists for some time as to the systemic position of the genus.

In 1897 Engler adopted a new subdivision of the *Gymnospermae,* the *Ginkgoaceae,* with a single genus *Ginkgo,* "because it was distinguished from the true Coniferae by the possession of motile male cells and other characteristics of more or less importance." This classification seems to be very generally accepted at the present time.

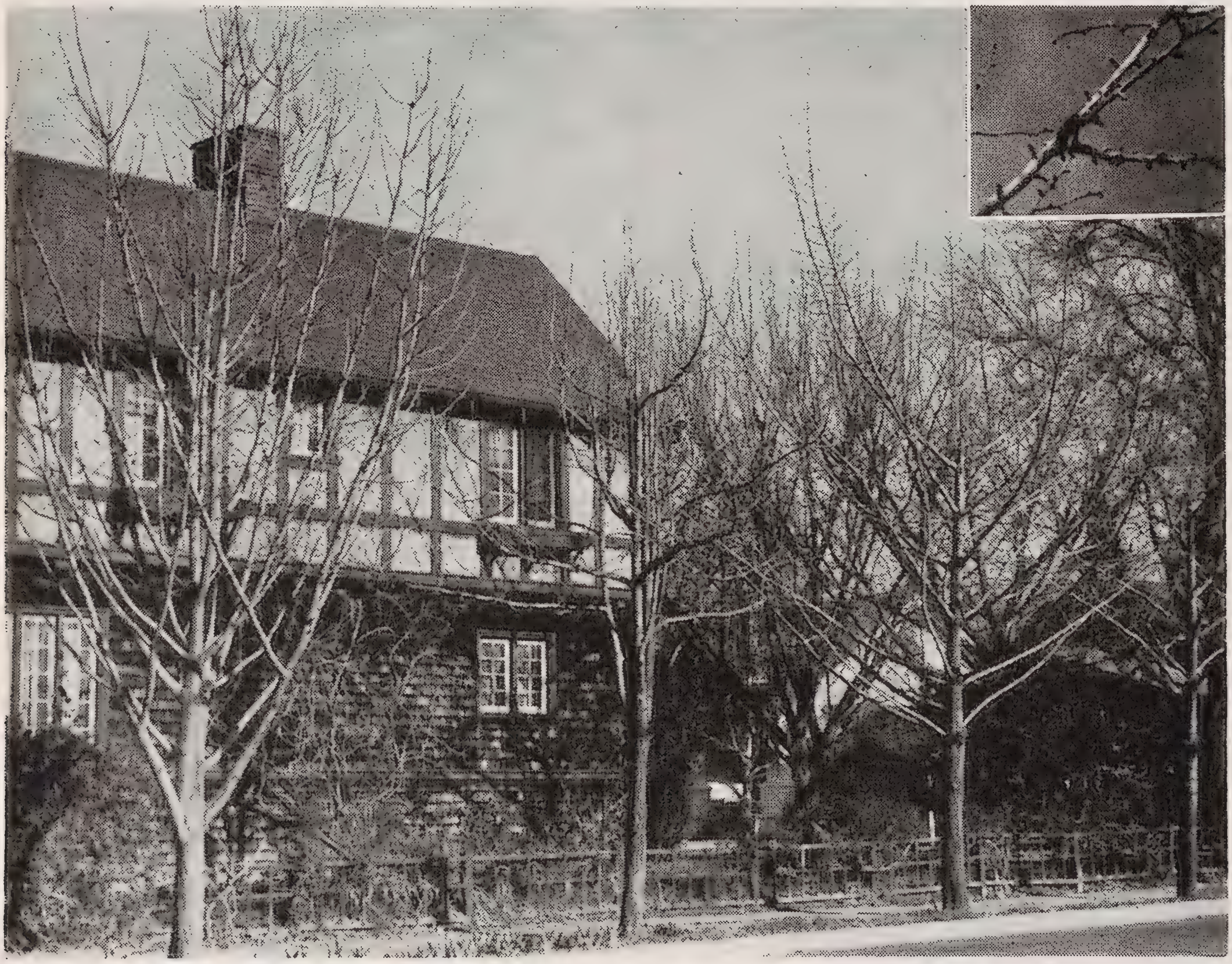

Fig. 33. *Ginkgo biloba;* trees showing variety of growth habit. Upper right corner, detail showing short and long growth. Photo by W. M. James.

Ginkgo biloba is one of the few deciduous Gymnosperms. It apparently attains a height of ninety feet and a diameter of four and one-half feet. Growth is relatively slow, especially where adverse conditions prevail. There seems to be little data as to the ultimate age. Seedlings vary somewhat in shape and habit of growth, from those with widely spread rounding top to those with a strongly excurrent (undivided) trunk and a steeply pryamidal outline. Records show that even the more slender appearing trees tend to broaden and become rounding at the top after fifty or sixty years. It takes fifteen to twenty years for them to reach fruiting age.

There are two kinds of growth in these trees; long shoots characterized by elongated internodes and relatively small pith and thin cortex (bark), and short shoots or spurs, with much abbreviated internodes and comparatively large pith and thick cortical regions. [Fig. 33]. The long shoot grows first and is somewhat similar in appearance to a seedling, having scattered single leaves with a bud in the axil of each petiole. Sometimes the same season (in California) and sometimes not until the next year a whorl-like group of leaves emerges from the axillary buds. This is the start of the short shoots. They elongate very slowly, with the

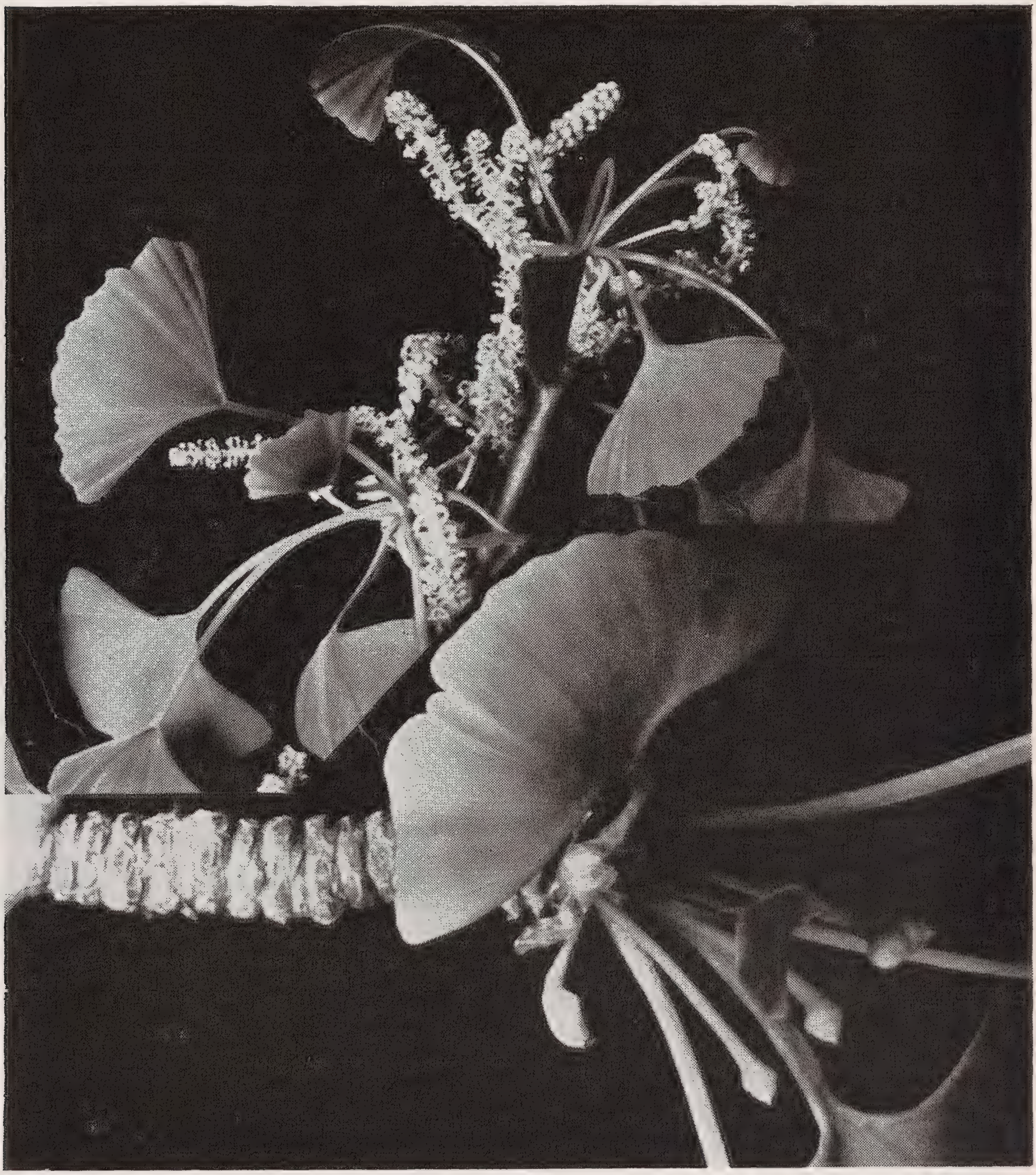

Fig. 34. *Ginkgo biloba.* Upper, staminate flowers; lower, pistillate flowers. Photo by W. M. James.

flowering stems of the male tree and the fruiting stems of the female tree emerging each year with the whorl-like group of leaves on the tip. Leaf scars are left, year after year, but they are too irregular to indicate any age. Trees up to sixty years old observed by the writer, have these short shoots scattered thickly throughout the inside of the tree, even on the larger branches. And leaves and fruit seem to grow as well in the reduced light inside the tree as they do in full light on the outside.

These two kinds of shoots are not morphologically fixed in character. The apex of a short shoot may suddenly elongate and become a long shoot, or the apex of a long shoot may fail to elongate and become a short shoot. Observations in the San Jose area indicate environment may have some influence on the ''mutability and periodicity'' of short and long shoots. Long shoots are generally rather short and not extensive on trees growing under adverse conditions. Trees in good soil and receiving plenty of water produced much more annual growth. Pruning has a tendency to make short shoots near the cut elongate enough to nearly equal the part removed.

Ginkgo leaves with their symmetrical dichotomous (forked regullarly in pairs) venation are very attractive. On the seedlings and the new long shoots the leaves are deeply lobed in the center and often have secondary lobes on each side. The first leaves which grow from the new axillary buds are generally bilobed and uniform. The leaves on the older short shoots are generally smaller, with a nearly entire margin, and resemble the leaves of *Adiantum* fern so closely as to suggest and warrant the common name of Maidenhair Tree. The color of the foliage is a pleasing shade of pale green which turns to a bright golden yellow in the fall.

The staminate inflorescence [Fig. 34] is borne in loose, catkin-like clusters from the axils of the whorl-like cluster of leaves on the tip of the short shoots. The dried flowers often remain on the trees for several weeks.

The pistillate flowers [Fig. 34] are borne in groups on the tips of the short shoots. Individuals consist of a long stalk bearing at its apex mostly two ovules. In the San Jose area a large percentage of these stalks mature two identical appearing fruits—but the ovary of one generally aborts. Pollination takes place in mid-spring. The motile male cells, similar to those of the Cycads, enter the ovule to complete fertilization in late summer or early fall. The fruit is a drupe [Fig. 35], consisting of an acrid, foul-smelling pulp surrounding a smooth, angular oval, cream to yellow colored, thin-shelled, sweet-kerneled nut.

The writer had a bad case of poisoning (dermatitis) from cleaning the seeds. Later, handling mature wood in the winter produced some discomfort. The effect on the skin is worse than from ''poison-oak'' *(Rhus diversiloba)*. Poison-oak causes watery pustules or blisters, and is accompanied by swelling and itching at intervals. In *Ginkgo* poisoning the pustules are smaller, with little swelling. The skin turns reddish and there is an almost continuous burning sensation. It took a month for recovery as against two weeks for poison-oak.

It has been suggested that the active agent in *Ginkgo* poisoning may be butyric acid. This is an organic compound and there are several saponifying agents. Washing the skin with commercial ethyl ether must be used cautiously, as it can saponify natural oils in the skin and cause so-called ether burns. Fortunately few people seem to be allergic to *Ginkgo* poisoning. San Jose doctors had never heard of it and had nothing about it in their literature.

The Maidenhair Tree is peculiar in that when the fruit containing the nut-like seed is apparently mature, the embryo is an undifferentiated mass of cells. "After fertilization there is a period of free nuclear division with generally eight taking place and giving rise to a possible two hundred fifty six free nuclei. Walls are then formed simultaneously throughout the embryo, enclosing cells which are approximately the same size. Then embryo organization and development takes place with maturity sometime during the winter". Temperature is apparently a factor in embryo development. Seed held in moist storage (damp sand) at room temperature germinates sooner than when held in cooler moist storage. But the seeds in the warmer storage germinate more unevenly! Seeds held in dry storage during fall germinate unevenly over a period of several months after planting. The problem apparently is to find a

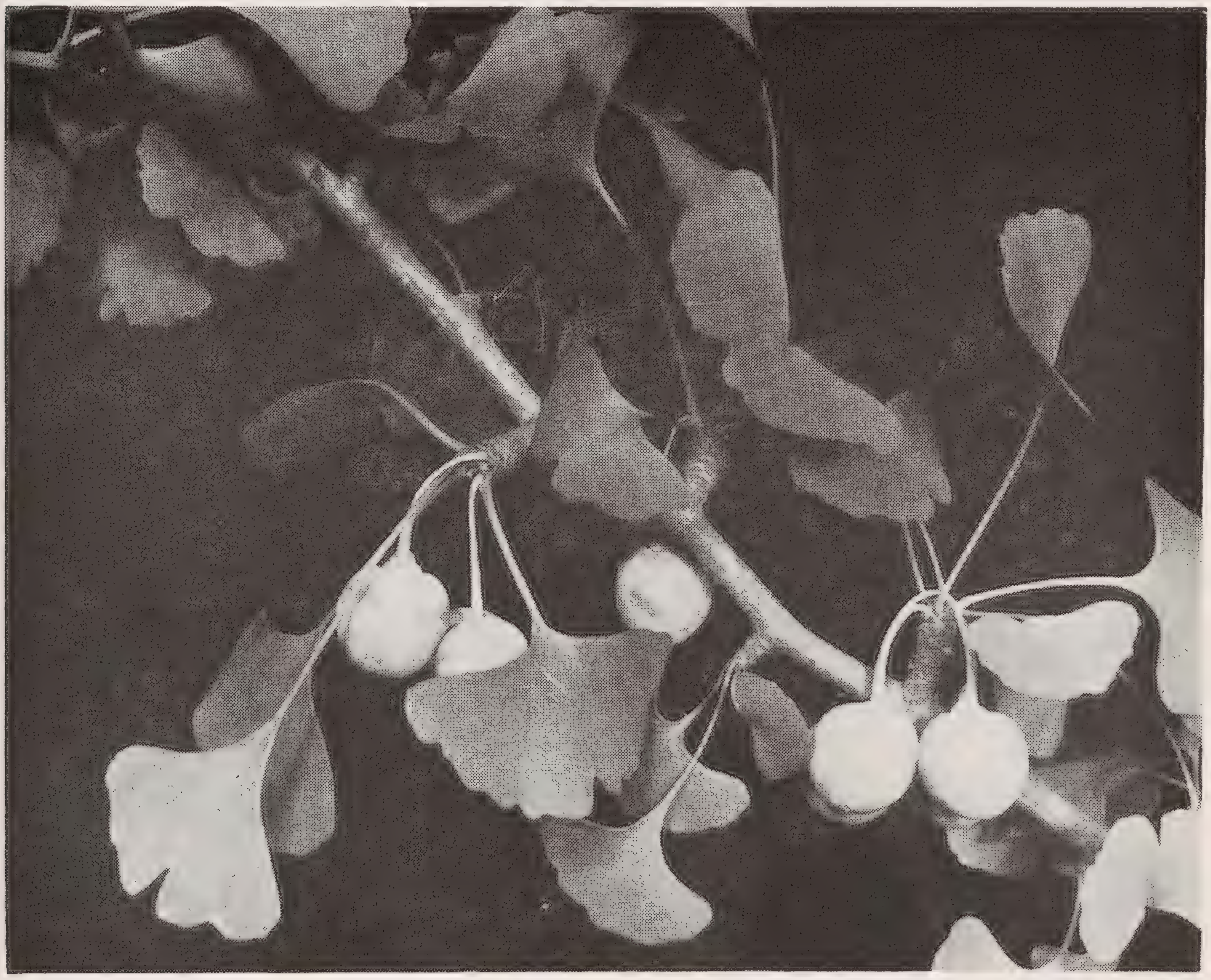

Fig. 35. *Ginkgo biloba.* Fruits. Photo by W. M. James.

way of handling or storing the seeds that will favor embryo development and retard germination until the embryo has matured.

The seed is medium-sized and nut-like with a relatively thin shell filled mostly by endosperm. The cotyledons are hypogeal (underground or hidden) and remain inside the shell, developing a definite hook on the end.

The MAIDENHAIR TREE can be propagated vegetatively in several ways. Half-ripe wood taken in mid-summer or ripe wood taken in winter roots well. Cleft grafting in late winter gives good results. Chip budding (or bud grafting) is very satisfactory, either in the spring with "current growth" buds placed in storage at the beginning of dormancy or with current or second year buds used in late summer direct from the trees.

Plants grown from cuttings do not seem to develop as fast as those grafted on seedlings. Some nurserymen grow seedlings in the field and dig them bare root after several years. The few plants seen by the writer which were handled this way have not started as vigorously when replanted as have those grown in containers. Each grower will probably have to determine which propagation method is best suited to his environment and requirements.

Study of *Ginkgo* anatomy is intensely interesting. It, along with most of the other Gymnosperms, differs in many ways from that of the Angiosperms. Apparently a cambium cell is the same, or an equivalent of a cell of the apical meristem or shoot apex in both Gymnosperms and Angiosperms. However, there seems to be agreement that Angiosperms have two plus cells on the outside growing zone in the tip and some of the Gymnosperms have only one layer. For instance, the apple has six layers of cells in the apex, hence six in the cambium. The inside cells of the cambium differentiate into xylem tissue which gradually changes into irregular channels for translocation from the roots to the upper parts of the plant. The outside cells differentiate into phloem tissue arranged so that it provides a means of moving the photosynthates from the leaves to the other parts of the plant. Obviously the factors governing or influencing growth and differentiation in the single-celled cambium of the *Ginkgo* would be different from those in a multiple-celled cambium of an Angiosperm. This brief reference to *Ginkgo* anatomy shows one more item which makes it a fascinating plant to study and observe.

The Chinese use the nut-like part of the seed in a dish prepared with several other ingredients during their New Year celebrations. A Chinese acquaintance in Honolulu mentions "roast duck with ginkgo seeds in the dressing" in correspondence with the writer. The Japanese roast the seeds much like Americans roast peanuts and the people in Thailand eat them prepared as a paste.

There seems to be little information on the use of the wood. It is rather soft for lumber and too slow growing for firewood. Beautifully hand-carved and attractively finished trays and novelties are being made from *Ginkgo* wood to some extent in Japan. However, the MAIDENHAIR TREE is very valuable for ornamental purposes. It is not too particular about the kind of soil it grows in or the amount of water it receives. Of course it grows much better in good soil and with plenty of water. It is apparently indifferent to the smoke, dust and fumes accompanying the industrial age in the cities. *Ginkgo biloba*, the MAIDENHAIR TREE, is paying fully in an aesthetic way for any effort expended by man in its redistribution in many places.

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GROWING ACHIMENES FROM SEEDS

S. W. SAYLER, SR., *Florida*

In 1955 I decided to try my luck at growing *Achimenes* from seeds. I have about 20 named clones to work with, and many crosses were made. The seed ripened and were gathered in October. Achimenes are strictly warm weather plants, and therefore the seeds were planted in early April, 1956.

Two quart pickle jars were cleaned and placed on one side. About ¾ inch of damp spaghnum moss was placed in the jars on the side of the bottom. Seeds were dusted on the spaghnum and the lids were screwed on the jars which were placed under azalea plants in the garden. They were left closed until the seedlings were about ¼ inch tall and ready for transplanting. Some were planted in pots, cans and flats. Those in the flats made the most rapid growth. The potting soil consisted of 1 part garden soil, ¼ part spaghnum peat and 1 part coarse sand. Good drainage is necessary, but the soil must be kept moist. An occasional feeding with a good soluble plant fertilizer is needed. Achimenes grow best in shade.

By August 1956, these plants were all in bloom, and brought many pleasant surprises. Now in September they are as large as those grown from tubers. I am trying to obtain better pink clones, and a yellow, if possible.

AGAVE VIRGINICA

JOSEPH C. SMITH, *M.D., California*

This is an interesting little plant with glabrous leaves and long exserted stamens previously known as *Manfreda virginica* but more recently classified as *Agave virginica* L. It is found growing in the Southeastern States extending as far north as southern Ohio, Indiana and Illinois. This is the most northly distribution of any member of the *Manfreda* group, the other members being warmer climate plants extending from Texas into Mexico and Central America.

Agave virginica forms the typical *Agave* rosette of leaves which in this species is deciduous. The smooth leaves are green or purple mottled in the form tigrina, slightly undulated, and may be entire or denticulate diminishing in size to bracts on the upper scape. They grow from a tuberous rootstock with long thick roots. The solid scape is one to two meters tall with the forty to fifty florets scattered in a loose spike. The individual flowers are not conspicuous except for their long exserted stamens and narrow tube which is twice longer than the erect lobes. The color is greenish yellow and at night they give off a fragrance described as similar to that of mace. In this species the anthers drop before the stigma is ready for pollination, a mechanism which insures cross pollination. Flowering extends over a three to four week period in July and August as the singularly placed florets open a few at a time up the long scape. Propagation is accomplished by both seed and offsets which are formed on the parent tuber in a manner similar to that in the tuberose.

Agave virginica transfers readily from its native habitat into cultivation. It is usually found growing in dry woods, thickets and on open slopes. My specimens came from Barren and Hart counties of Kentucky. In that region near the Mammoth Cave National Park limestone rock is not far from the soil surface even when not seen to be actually outcropping. So far it seems to tolerate the neutral to alkaline soil condition of southern California and has not proved difficult to handle in cultivation. Wetness during the dormant season is not a problem and in its northern range it is occasionally exposed to subzero temperatures.

Other relatives of *Agave virginica* are *A. maculata* from south Mexico, *A. maculosa* from Texas, *A. brachystachis* from Mexico and Guatamala. *A. variegata* from Texas and Mexico, and *A. gutatta* from Mexico and Central America. Other closely allied species include the *Runyoniae*. The relationship of these to the other branches of the *Agavaceae* should be studied by attempting crossing experiments.

CHROMOSOME NUMBERS AND SPECIATION IN THE GENUS **ZANTEDESCHIA**

Gertrude Earl

INTRODUCTION

The genus *Zantedeschia,* a small genus in the family Araceae limited to South and Tropical Africa, is commonly known as the calla lily genus. There is still some confusion as to the proper generic name, but as Traub (1948) has traced the history of the nomenclature, it seems *Zantedeschia* must be considered the correct designation. In the first edition of *Species Plantarum* (1753) Linnaeus listed two species in the genus *Calla* L., *C. palustris* L. and *C. aethiopica* L. The former, considered as the type, is an aquatic species native to the northern hemisphere. Kunth (1818) recognized the dissimilarity of the two species and proposed the generic name *Richardia* for the taxon *Calla aethiopica*. *Richardia* had already been applied to a genus in the Rubiaceae and could not validly be used; hence Sprengel (1826) introduced the generic name *Zantedeschia* which should be accepted.

In addition to the type species, *Zantedeschia aethiopica,* some ten others have been proposed. Traub (1948) in the most recent monograph of the genus recognized eight species as valid but conceded that further study will be necessary before that number can be accepted as definite. The species accepted by Traub are as follows: *Z. aethiopica* (L.) Sprengel, *Z. albomaculata* (Hook. f.) Baillon, *Z. angustiloba* (Schott) Engler, *Z. hastata* (Hook. f.) Engler, *Z. Elliottiana* (Knight ex Watson) Engler, *Z. melanoleuca* (Hook. f.) Engler, *Z. Sprengeri* (Comes) Burtt Davy, and *Z. Rehmannii* Engler.

These species are found in various habitats in the range in South and Tropical Africa (Engler 1908, Brown 1868, 1894). *Zantedeschia aethiopica,* the white calla of the florists, is common on the humid meadows around Capetown and generally in southwest Capeland, and the limits of the species extend eastward to Natal. The spathe is milk-white, and the anthers are bright yellow. The green, unspotted leaves are cordate or hastate. *Zantedeschia albomaculata* is also native to the Cape of Good Hope but prefers higher elevations. It is found on the Witte Bergen up to a height of 5000-6000 feet and has also been collected in Tembuland at a height of 2000-2500 feet. The spathe is milk-white but bears a dark purple-brown blotch inside at the base. The leaves are hastate or saggitate with numerous elongated semi-transparent white spots.

Zantedeschia melanoleuca occurs in Natal and also in Tropical Africa in the Mozambique district. Here the spathe is light yellow or greenish-yellow with a dark purple-brown blotch at the base inside. The leaves are deltoid or ovate-deltoid also with numerous semi-transparent white spots. *Zantedeschia angustiloba* has the most widespread distribution of any of the species and is native to both coasts around the Kalahari desert. On the east coast its range extends from Transvaal into Tropical Africa. On the west coast the species is native to Lower Guinea in Angola and is frequent in deep stagnant places in swamps near rivers. The spathe is of a clear deep gamboge-yellow color with a dark purple-brown blotch at the base inside. The leaves are unspotted and elongate-deltoid or elongate-oblong.

Zantedeschia hastata has been collected in Natal in swamps, and its range extends into Basutoland and Transvaal and into Tropical Africa around Lake Nyassa. Its spathe is a light greenish-yellow with a dark blotch at the base inside, and the hastate, green leaves are unspotted. *Zantedeschia Elliottiana* is a tropical species and is found in the Mozambique district and in tropical Transvaal. The spathe is of a bright golden-yellow color without a blotch. This is the ''Golden Calla'' of the florists. The bright green ovate leaves are marked with numerous transparent white elongated spots. *Zantedeschia Sprengeri* is found in Transvaal, and the spathe of this species is yellow also.

Zantedeschia Rehmannii has been collected on steep stony hills up to elevations of 4500 feet in Natal. The spathe of this is light rosy-purple, darker but not blotched within at the base. The lanceolate leaves are quite distinctive from the leaves of the other species and are marked with short, linear semitransparent white spots.

Although many of the species have been common horticultural plants in Europe and this country for over two centuries, there has been little cytological investigation in this genus. In fact the chromosome number of only a single species, *Z. aethiopica,* has been listed previously in the literature. Overton (1909) found a n number of 16 in the pollen mother cells of this species, and Michell (1916) who was studying the development of the embryo sac reported 12 bivalents in the megaspore mother cells. Kurabubo (1940) listed a 2n number of 32 for an unidentified species of *Zantedeschia.* Mookerjea (1955) reported a 2n number of 32 for a plant she has listed as *Richardia aethiopica* and a 2n of 28 for *R.* ''Golden Calla'' which she has called a ''horticultural type.''

MATERIALS AND METHODS

In this study mitotic chromosome numbers were determined from root tips taken from plants grown in pots in the greenhouse. For studying meiosis, anthers were collected from plants grown in the field. The plants were grown mainly from corms and occasionally from seed secured from commercial houses in this country. Material of several species and a hybrid was furnished to Dr. W. S. Flory by Dr. H. P. Traub, and the Brown Bulb Ranch of Capitola, California, also donated material. Two lots of plants of *Z. albomaculata* were grown from seed from the Botanic Garden in Essen, Germany.

The root tips were pretreated from two to three hours in a saturated solution of paradichlorobenzene (Meyer 1945). They were then fixed in Craf solution and dehydrated in n-butyl alcohol according to Randolph's technique (1935), sectioned at 10 to 15 microns, and stained in crystal violet. The anthers were smeared directly in aceto-orcein. The pollen mother cells undergo meiosis while the spadix and spathe are still hidden at the base of the leaves. The spadix is quite small at this point, less than two cm. in length, and the anthers are scarcely one mm. wide.

Drawings were made with the aid of a camera lucids at a magnification of x3500.

RESULTS

Six of the eight recognized species as well as four varieties and three hybrids were examined cytologically. The identity of the variety New Cream, or more properly clone New Cream, according to Traub, is still uncertain. Traub has suggested it is most probably a sport of *Z. albomaculata.* In the root tips a 2n number of 32 has been found in all the material with a single exception (table 1, fig. 1-8). The exception was a seedling plant of *Z. Elliottiana* in which an anueploid number of 33 occurred (fig. 9). Since the plant died before reaching maturity it was impossible to study meiosis in it. In other plants of *Z. Elliottiana* a 2n number of 32 was found.

The mitotic chromosomes are from one to three microns in length. It is difficult to observe many morophological details of chromosomes of

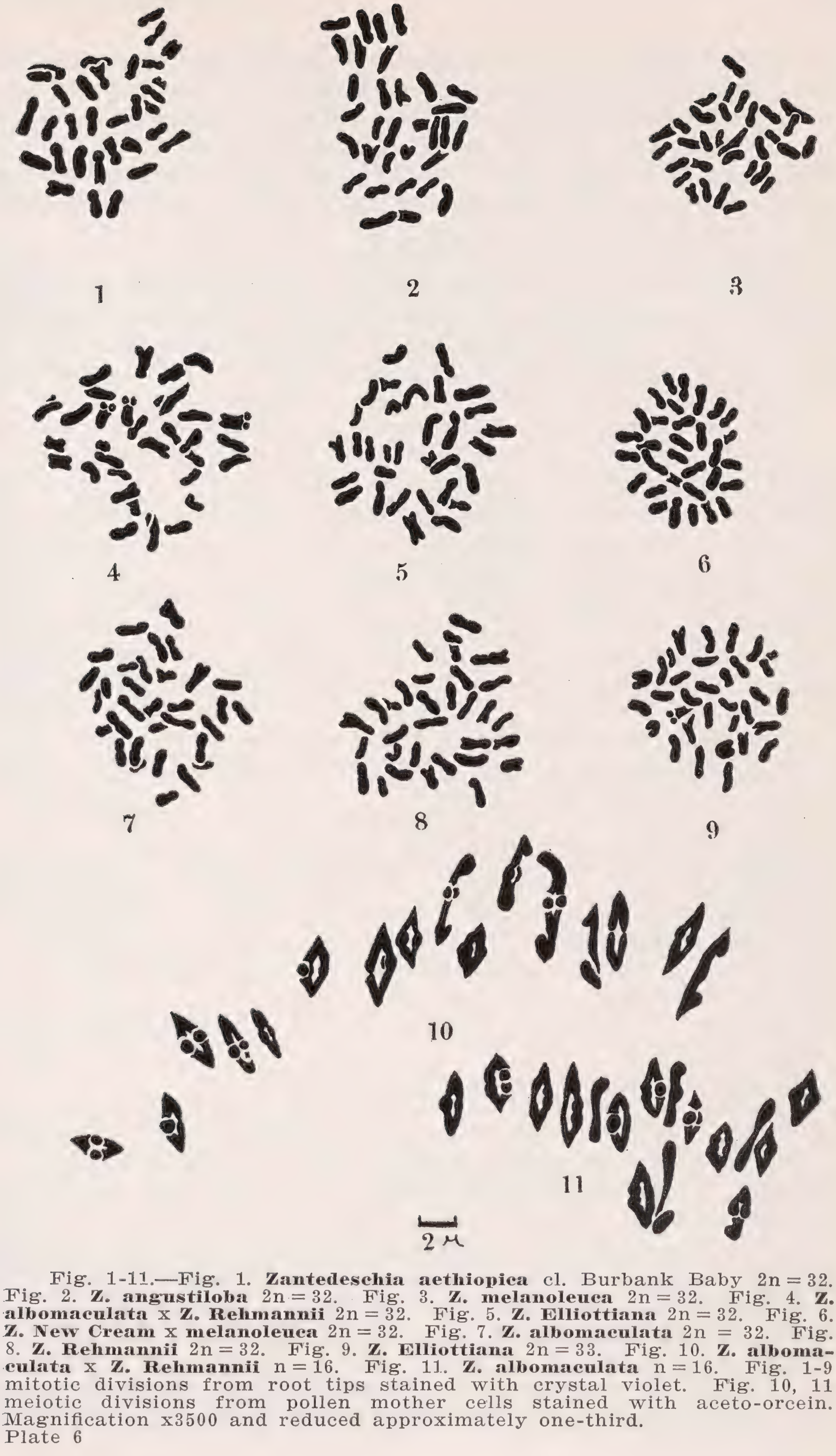

Fig. 1-11.—Fig. 1. **Zantedeschia aethiopica** cl. Burbank Baby 2n = 32. Fig. 2. **Z. angustiloba** 2n = 32. Fig. 3. **Z. melanoleuca** 2n = 32. Fig. 4. **Z. albomaculata** x **Z. Rehmannii** 2n = 32. Fig. 5. **Z. Elliottiana** 2n = 32. Fig. 6. **Z. New Cream** x **melanoleuca** 2n = 32. Fig. 7. **Z. albomaculata** 2n = 32. Fig. 8. **Z. Rehmannii** 2n = 32. Fig. 9. **Z. Elliottiana** 2n = 33. Fig. 10. **Z. albomaculata** x **Z. Rehmannii** n = 16. Fig. 11. **Z. albomaculata** n = 16. Fig. 1-9 mitotic divisions from root tips stained with crystal violet. Fig. 10, 11 meiotic divisions from pollen mother cells stained with aceto-orcein. Magnification x3500 and reduced approximately one-third.

Plate 6

this size. Centromeres appear to be at a medium to sub-median location. There is a similarity of chromosomes complements among the species, varieties, and hybrids. Meiosis was examined in three species, *Z. Elliottiana Z. albomaculata* (fig. 11) and *Z. Rehmannii.* Meiosis in one hybrid, *Z. albomaculata* x *Z. Rehmannii* (fig. 10) was also examined. In both species and hybrids 16 bivalents have been found to be formed regularly.

DISCUSSION

Although there has been no account of naturally occurring hybrids, artificial hybridization has been fairly extensive in this genus. According to Traub (1948) hybridization is possible among all the species with the exception of *Z. aethiopica.* This latter species has a ramifying root stock and does not require a resting period as opposed to the remaining species which have compact corms and require a resting period. Traub stated that seed set in crosses involving *Z. aethiopica* but that these do not germinate and eventually rot.

Table 1. Chromosome numbers in **Zantedeschia**

Species and Hybrids	Accession Number	Source	n	2n	Figure in Plate 6	Author
Z. aethiopica	13006-54-2	Brown Bulb Ranch Capitola, Calif.		32		Earl
Z. aethiopica	S13146-53-1	Rex Pearce Moorestown, N. J.		32		Earl
Z. aethiopica cl. 'Godfrey' calla	13007-54-b	Brown Bulb Ranch		32		Earl
Z. aethiopica cl. 'Burbank Baby'	13144-53-5	Len Mirzwick Healdsburg, Calif.		32	1	Earl
Z. aethiopica[1]			16			Overton (1909)
Z. aethiopica[1]			12			Michell (1916)
Z. aethiopica[2]				32		Mookerjea (1955)
Z. albomaculata	S13134-53	Botanischer Garten Essen		32		Earl
Z. albomaculata	S13148-53	Pearce		32		Earl
Z. albomaculata	13004-53	Brown Bulb Ranch	16	32	11,7	Earl
Z. albomaculata cl. 'New Cream'	13137-53	Mirzwick		32		Earl
Z. angustiloba	13034-53	Len Woefle Cincinnati, Ohio		32	2	Earl
Z. Elliottiana	39-53	Pearce		33	9	Earl
Z. Elliottiana	13002-53	Brown Bulb Ranch	16	32	5	Earl
Z. Elliottiana[3]				32		Mookerjea (1955)
Z. melanoleuca	13136-53	Mirzwick		32		Earl
Z. melanoleuca	13030-53	Woefle		32	3	Earl
Z. Rehmannii	S13147-53	Pearce		32		Earl
Z. Rehmannii	13003-54	Brown Bulb Ranch	16	32	8	Earl
Z. Rehmannii cl. 'Superba'	13035-53	Woefle		32		Earl
Z. New Cream **x Z. melanoleuca**	13138-53	Mirzwick		32	6	Earl
Z. melanoleuca x Z. Rehmannii = Z. cantabrigiensis cl. 'Mrs. Roosevelt'	13031-53	Woefle		32		Earl
Z. albomaculata x Z. Rehmannii	11453-47	Traub	16	32	10,4	Earl

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[1] Designated **Richardia africana Kth.** by authors.
[2] Designated **Richardia aethiopica** by author.
[3] Designated **Richardia** "Golden Calla" by author.

The similar chromosomes complements, the ease of hybridization within the compact corm group, and the behavior of the meiotic chromosomes in the hybrids are all factors suggesting that speciation in the genus has proceeded chiefly by gene change. Mookerjea (1955) who found a 2n number of 28 for *Richardia* "Golden Calla" was possibly examining *Z. Elliottiana* since this species is sometimes sold in the trade as "Golden Calla." This variation in chromosome number, unless it is a unique occurrence, is somewhat difficult to understand in view of the constancy of the chromosome number in mitosis and meiosis in the material examined here. If such variation in chromosome number were common, then an additional factor would be reponsible for speciation in this genus. Mookerjea also differentiated the small chromosomes to a fairly high degree. She describes ten satellites or secondary constrictions in ten of the small chromosomes of *Richardia aethiopica* and six in the 28 chromosomes of *R.* "Golden Calla." If such variation occurs then a third factor of chromosomal change would have to be considered in a discussion of speciation.

These changes whether they be at the gene or chromosome level, have brought about variations in the original type of the genus which have become adapted to different niches in the range. The result will be an external ecogeographical isolation or ecological separation of sympatric types (Stebbins 1950, pp. 196-200). This applies to the species in the compact corm group. The barriers between *Z. aethiopica* and the latter group are greater than isolation or separation. Traub (1948) suggests there may be a distinct gap from the standpoint of gene exchange. Given time and continued isolation similar barriers could possibly arise within the compact corm group.

The writer wishes to thank Dr. Walter S. Flory who suggested this problem for advice and encouragement and for his invaluable help in securing material.

SUMMARY

1. The chromosome number of six species, four varieties, and three hybrids in the genus *Zantedeschia* has been found to be 32. At meiosis in three species and one hybrid examined 16 bivalents are regularly formed.

2. Speciation in this genus seems chiefly a result of mutation at the gene or chromosome level.

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* Seen by reference only (Traub 1948).

† Seen by reference only (Ito 1942).

ZOYSIA X FORBESIANA HYBR. NOV.

Hamilton P. Traub, *California*

During the years 1948-49, Dr. Ian Forbes, Jr., Research Agronomist, U. S. Dept. of Agric., at Beltsville, Maryland, made several hybrids between species of the genus *Zoysia* Willd. (Forbes, 1952). The work was carried on cooperatively by the U. S. Dept. of Agric., the University of Georgia, Coastal Plain Experiment Station, and the U. S. Golf Assoc., Greens Section. The most successful of these hybrids for southern California is the cross between *Z. japonica* Steud. and *Z. tenuifolia* Willd. A clone of this hybrid has recently been introduced by the cooperating organizations under the fancy name, 'Emerald'.

In San Diego County this clone under test has so far proved to be evergreen and is fairly rapidly growing. It is intermediate between the two parents, and is a short day plant, beginning to flower outdoors in October. Since this hybrid is a genuine biologic success as a lawn grass in this region, and further breeding work with it is being carried out by the writer, it needs to be referred to often and this makes it advisable to give it a two part name in honor of the scientist who made the original cross.

Zoysia x **forbesiana** Traub, **hybr. nov.**

Hybrida inter *Z. japonicam* et *Z. tenuifoliam* posita sed anthesis Octobri incipet.

Intermediate between the two parents, *Z. japonica* Steud., and *Z. tenuifolia* Willd. Begins to flower in October in California. Holotype: Traub No. 547 (TRA), cult. La Jolla, Calif., Oct. 15, 1956.

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PLANT LIFE LIBRARY

DARLINGTON'S "CHROMOSOME BOTANY"*

CHROMOSOME BOTANY has much to offer those with an interest in the origin of cultivated plants, particularly the ornamental plants. Professor Darlington points out that experimental breeding is concerned with a few hundred cultivated species, while chromosome studies are scattered over several thousand species, mostly wild. Each set of data acts as a check on the other and together they make it possible to combine our knowledge of wild and cultivated species with that of systematics and ecology. It is the purpose of the book to weave this information into a coherent picture.

On the whole, the author has done a remarkably competent job of synthesis with the vast amount of material at his disposal within a span of 180 pages. Darlington is particularly skillful at formulating new, bold and stimulating hypotheses, and in drawing attention to critical areas where our knowledge is weak or even non-existent. Many will disagree with some of his generalizations, mostly because present evidence is not decisive. However, his theories do provide a framework for focusing discussion, and a base from which further advances can be made. Darlington is never dull, but his book must be read with critical discrimination, for there are no well-labeled sign posts to warn the unwary.

Readers of Plant Life will be most interested in the last two chapters (V. Cultivated Plants, and VI. Ornamental Plants). In Darlington's words, "Cultivated plants, in general, have given us a clearer view of the principles at work in the evolution of wild plants. But there remain certain genetic problems on which their evidence is too remote to be certain. In order to settle these questions we must closely examine the best understood of all plants, those most recently introduced into cultivation, the ornamental plants".

In contrast to the staple cultivated plants, where the method of origin and subsequent history has often been blurred or erased by time and other factors, the ornamental plants are comparatively recent, and their origin and history is well-documented. From the immense number of species that could have been mentioned, Darlington has chosen 8 examples to illustrate the principles involved—*(Lathyrus odoratus*—Sweet Pea; *Primula sinensis*—Chinese Primrose; *Hyacinthus orientalis*—Hyacinths; *Narcissus; Iris*—Bearded Iris; *Rosa*—Roses; *Chrysanthemum; Dahlia variabilis*—Dahlias).

The details of chromosome history of the individual examples cited above makes fascinating reading, and is well worth extended study. There is an index and about 130 literature references. The references are collected in the rear of the book under the pertinent chapter headings.—*Thomas W. Whitaker.*

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* CHROMOSOME BOTANY, by C. D. Darlington. Allen & Unwin, London, and Macmillan Co., 60 5th Av., New York 11, N. Y. 1956. pp. 180. Illus. $2.75.

DARLINGTON & WYLIE'S "CHROMOSOME ATLAS OF FLOWERING PLANTS" WITH SPECIAL REFERENCE TO THE AMARYLLIDACEAE *

HAMILTON P. TRAUB

The readers will remember that in 1946, Darlington & Ammal's "Chromosome Atlas of Cultivated Plants" (1945) was reviewed in these columns. This important work was welcomed by many of the readers who have attested to its value by writing to the editor about it. It is now his pleasure to review a revised and enlarged Chromosome Atlas by Darlington & Wylie.

I. ENLARGED CHROMOSOME ATLAS

It is indicated that chromosome numbers have now been studied in some fifty thousand flowering plants belonging to nearly twenty thousand species. In order to make such information generally available, the scope of the book has been enlarged to include the chromosome data of all flowering plants. This has increased the size of the volume. The introductory essay in the 1945 volume has also been revised and enlarged in scope and it is now published as a separate volume, "Chromosome Botany", which is reviewed by your Executive Secretary, Dr. Whitaker, above. It remains for the writer to review the "Chromosome Atlas".

The plan of the new volume is similar to that followed in the earlier one. The somatic chromosome numbers are given for the species which are grouped under genera. The latter are grouped under tribes, if necessary, or directly under the families. The families are grouped under orders, except in the Gymnosperms, and the orders in the Dicotyledons and Monocotyledons, are placed in groups of orders.

Opposite the genera, the basic chromosome numbers are given. To the right of the somatic numbers of the species, the workers reporting the data, the year of publication, uses of the plants and distribution, are indicated.

II. THE ATLAS AND THE AMARYLLIDACEAE

In another paper (Traub, 1957a), the writer has presented a classification of the *Amaryllidaceae* down to the generic level. In this it is pointed out that although Darlington & Wylie include the tribes *Gilliesieae* and *Hemerocalleae* in the *Amaryllidaceae,* they have retained the tribes *Allieae* and *Agapantheae* in the *Liliaceae* in total disregard of morphological and chromosomal similarities. The severance of the *Allieae* and *Agapantheae* from the *Gilliesieae* ignores the fact that all three have apparently evolved from a common ancestral stock. The *Gilliesieae* [$x=10(11)$] are the most advanced with flowers usually zygomorphic as contrasted with actinomorphic flowers in the more primitive *Allieae* [$x=5$, 6, 7, 8, 9] and *Agapantheae* [$x=6$, 15]. Thus the horizontal decapitation made by Darlington & Wylie is artificial and arbitrary. These authors have failed to note that when the classification of the *Amaryllidaceae* (Traub, 1957a), which was originally based on morphological similarities, is reinforced with the chromosome data, it is evident that the original hypothesis is borne out. On this basis the *Allieae* and *Agapantheae* definitely belong with the *Amaryllidaceae* and are out of place in the *Liliaceae.*

In the Atlas, the diversified genera of *Liliaceae* are grouped under tribes, but the genera of *Amaryllidaceae,* also diversified, are treated as *one homogeneous group!* The order of arrangement follows their rule "which is to proceed from the lower to higher numbers". When homogeneous groups are concerned, this principle may work apparently, but it cannot be applied to *an entire diversified family*—the *Amaryllidaceae* in this case. In this instance it is obviously necessary to group the genera into tribes to reveal probable relationships according to the morphological similarities, and then test the hypothesis by adding the chromosome data (Traub, 1957a).

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* C. D. Darlington & A. P. Wylie. Chromosome Atlas of Flowering Plants. The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. 1956. pp. 519. $10.50.

Only in this manner may the objective enunciated in the Preface of the Atlas be achieved—"To show how chromosome numbers can be used as a basis of classification of species, genera and families."

What are the particulars in this instance? It should be noted for example that in the genera belonging in the tribe *Amarylleae* (Traub, 1957a), *Lycoris* is separated by four distantly related genera from *Ungernia,* and the latter is separated by nine such genera from *Amaryllis* L. 1753 (syn.—*Hippeastrum* Herb. 1821). Among genera that belong to the tribe *Galantheae, Galanthus* is separated by three distantly related genera from *Leucojum,* and the closely related *Lapiedra* is separated from it by seventeen distantly related genera. Among genera belonging to the tribe *Crineae,* the Cape Belladonna, *Brunsvigia rosea* (under a misapplied name, "Amaryllis belladonna"), a species, is separated from its genus, *Brunsvigia,* by two distantly related genera. These are only a few examples of the many that could be cited to show the utter chaos that reigns in the *Amaryllidaceae* as presented in the Atlas. All of this is due to the fact that the genera were not grouped under tribes.

In this connection it should be emphasized that the Cape Belladonna, *Brunsvigia rosea* is so closely related to other *Brunsvigia* species that fertile hybrids have been produced between them beginning over a century ago (Traub & Moldenke, 1949; Traub, 1954, 1957b; Hannibal, 1955, 1957). The available evidence shows beyond any doubt that the Cape Belladonna is a *Brunsvigia.* This is an excellent example showing the value of chromosome data and breeding experiments in solving a taxonomic problem, but Darlington and Wylie ignore the progress made and mark time.

Another instance showing the necessity of grouping the genera under tribes is revealed in connection with *Leptochiton quitoensis* (= *Hymenocallis quitoensis)* x=12. This *nomenclatural* genus differs from the *biologic* genus *Hymenocallis* only in having whitish-colored seeds, and thus has to *remain* united with the latter. When arranged under tribes, *Leptochiton,* if retained as a nomenclatural genus, would appear next to *Hymenocallis,* for which x=23 is indicated as the basic number in the Atlas. However, in a proper arrangement, *Leptochiton* is conspecific with *Hymenocallis* and the basic number of the latter would be indicated as x=12 and not 23!

Since the data for the *Amaryllidaceae* in the Atlas is hopelessly scrambled, the classification by Traub (1957a), on the tribal and generic levels together with the somatic numbers of the species in the Atlas, should be used until the chaos can be cleared up in a later edition of the Atlas.

III. RECOMMENDATIONS

Although in section II of this review specific instances have been cited where the present text of the Atlas is deficient, this should not be interpreted as a condemnation but rather as a purely constructive criticism toward the end that the Atlas may be made even more valuable in future editions. On the whole, the criticisms do not apply to the data for the other plant families included. The Atlas as a whole is therefore highly recommended to the members, with the reservations indicated for the *Amaryllidaceae.* It is believed that the Atlas is indispensable to all who are seriously interested in plant science.

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THE R. H. S. DICTIONARY OF GARDENING, A PRACTICAL AND SCIENTIFIC ENCYCLOPAEDIA OF HORTICULTURE, edited by F. C. Chittenden; 2nd ed. 4 vols. pp. 2316. illus. $55.00. 1956; and SUPPLEMENT, pp. 334. illus. $10.00. 1956, both edited by P. M. Synge. Published by Oxford University Press, 114 Fifth Ave., New York 11, N. Y.

The second edition of this monumental work, and the first supplement, constitute a mine of information about plants suitable for cultivation in the British Isles and other temperate climates, and many tropical and subtropical plants cultivated all over the world. The general account of each genus is followed by descriptions of individual species (many illustrated), and hybrids that are widely cultivated. There are also general articles on gardening technic and definitions of botanical terms.

The second edition of the main work has not been reset, but cross references have been corrected, some additional references to illustrations have been inserted, and other smaller alterations have been made.

The supplement contains lists of recommended varieties of flowers, fruits and vegetables. Over 200 pages are devoted to corrections to the first edition of the main work, and to new articles on subjects that were omitted from the first edition of the main work, or subjects which have developed since publication to such an extent as to need fresh treatment. Special emphasis is given to pest control.

This monumental work and the supplement are a must for all who are interested in horticulture.

PLANT PROPAGATION by J. P. Mahlstede and E. S. Haber. pp. 413. Illus. 1957. $7.50. John Wiley & Sons, 440 4th. Av., New York 16, N. Y. This new book on plant propagation for the beginning student, the experienced seedsman, and nurseryman fills a definite want. The parts of the book are devoted to the basic principles of propagation, sexual and asexual increase of higher plants, propagation structures and increase of specific plants. This is a new and refreshing treatment of an important subject, and the book is highly recommended.

In a later revised edition, it is hoped that the subject of increase of *Amaryllis, Allium, Crinum,* etc., by vertical bulb cuttage (See Traub—Amaryllis Manual, Macmillan. 1957) will be included.

EVOLUTION, GENETICS AND MAN, by T. Dobzhansky. John Wiley & Sons, 440 4th Av. New York 16, N. Y. 1955. Pp. 398. Illus. $5.50. The purpose of this new book is "to show to the student that biology is not only a craft which is interesting to technicians and devotees but also a part of the fabric of humanistic thought." The early chapters deal with elementary genetics and provide a foundation for understanding of the process of evolution that is elaborated in the rest of the book. This inspiring book is highly recommended to all.

SOIL PHYSICS, by L. D. Baver, 3rd ed. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1956. Pp. 489. Illus. $7.75. This revised edition of a standard work on soil physics is in many respects a new book which includes recent major contributions to the subject. It is designed primarily for advanced undergraduate and graduate college students. The book begins with a discussion of the fundamental make-up of the soil and progresses through physical properties of the various soil components. It is highly recommended.

BOTANY; AN INTRODUCTION TO PLANT SCIENCE, by W. W. Robbins, T. E. Weier and C. R. Stocking. 2nd ed. John Wiley & Sons, 440 4th Ave., New York 16, N. Y. 1957. Pp. 578. Illus. $6.95. This improved and modernized revision of an outstanding text on plant science, written in simple language, has been designed with the student in mind. It emphasizes "the plant as a whole as a living, functioning organism" with increased stress on plant physiology. The other phases of the subject receive adequate attention. It is highly recommended.

BOTANY; A LABORATORY MANUAL, by T. E. Weier, C. R. Stocking and J. M. Tucker. 2nd ed. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1957. Pp. 175. Illus. $2.95. This is an excellent laboratory manual. The revisions are concerned mostly with adding material to keep its subject matter in line with the

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2. DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948, by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $2.50 postpaid.

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second edition of Botany; An Introduction to Planr Science, which is reviewed above. The manual is also highly recommended.

HANDBOOK FOR VEGETABLE GROWERS, by J. E. Knott. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1957. Pp. 238. $3.95. This handbook brings together in concise tabular form much of the widely scattered information that relates to vegetable production. It is highly recommended to those engaged in vegetable growing.

SOIL STERILIZATION, by W. J. C. Lawrence. Macmillan Co., 60 5th Av., New York 11, N. Y. 1956. Pp. 169. Illus. $3.50. The purpose of this important new book is to bring the facts about soil sterilization under one roof with emphasis on new information and precision in soil sterilization. This is a must for all who grow plants.

AN INTRODUCTION TO PLANT TAXONOMY, by G. H. M. Lawrence, Macmillan Co., 60 5th Av., New York 11, N. Y. 1955. Pp. 179. Illus. $3.25. This is an abridged form of the author's longer work on Plant Taxonomy previously reviewed here. The present book was written "for the adult amateur botanist and the student of a local flora course at the college level", and is restricted in scope to vascular plants—ferns, gymosperms and flowering plants. This clearly and concisely written text is highly recommended.

CHEMISTRY AND USES OF PESTICIDES, 2nd ed., by E. R. de Ong. Reinhold Publ. Corp., 430 Park Av., New York 22, N. Y. 1956. Pp. 334. Illus. $8.75. In this second edition the entire text has been rewritten and brought up-to-date. It includes valuable information on insecticides, fungicides, herbicides, rodenticides, repellents and seed disinfectants. This excellent text is highly recommended to the college instructor, manufacturer, research worker and farmer who is concerned with pest control problems.

CHEMISTRY OF THE SOIL, edited by F. E. Bear. Reinhold Publ. Corp., 430 Park Av., New York 22, N. Y. 1954. Pp. 373, $8.75. This comprehensive coverage of the chemical aspects of soils in relation to their development, present constitution and uses, includes contributions from fourteen outstanding soil chemists. This handy volume of useful information is highly recommended for soil scientists, biochemists, food chemists, large-scale farmers, manufacturers of liming materials, fertilizers, soil conditioners, insecticides and other agricultural chemicals.

A NEW COURSE OF PLANTS AND ANIMALS; Book I, by M. A. Grigg. Cambridge Univ. Press., 32 E. 57th St., New York 22, N. Y. 1956. Pp. 216. Illus. $1.50. This clearly and concisely written book is intended as a guide during the first three years of grammar school. It includes chapters on the aquarium, small and larger animals in fresh water, animal life in gardens and countryside, flowers and seeds, and structure of a flowering plant. Highly recommended.

THE HISTORY OF THE BRITISH FLORA, by H. Godwin. Cambridge Univ. Press., 32 E. 57th St., New York 22, N. Y. 1956. Pp. 384. Illus. $16.50. On the basis of all available well-dated records of plant remains of the whole Quaternary Period, Dr. Godwin gives an outline of the course whereby the British flora reached

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EDITED BY
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1958

Year Book of
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GENERAL AMARYLLID EDITION

EDITED BY
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Central America—Mr. Ralph Pincus, **Chicacao, Guatemala**
England—Mr. Reg. F. Harradine, **Potters Bar**
Holland—Mr. Ernst H. Krelage, **Haarlem**
India—Mr. Sidney Percy-Lancaster, **Lucknow**
Kenya Colony, East Africa—The Lady Muriel Jex-Blake, **Nairobi**
Union of South Africa—Dr. R. A. Dyer, **Pretoria**
Venezuela—. . . . . . , **Caracas**

[THE AMERICAN AMARYLLIS SOCIETY—continued on page 151.]

PREFACE

This 25th issue of HERBERTIA is appropriately dedicated to Wyndham Hayward who was one of the prime movers in the organization of the AMERICAN AMARYLLIS SOCIETY in 1933. In recognition of his services to the Society, and his help in the advancement of the amaryllids over a quarter century, he received the HERBERT MEDAL AWARD in 1958. Mr. Hayward contributes an autobiography but it must be pointed out that he is a very modest man and he far from does himself justice. His influence on the advancement of the amaryllids has been far greater than he indicates. He has unselfishly given of himself in furthering the popularization of amaryllids and many other plants, and his host of friends in America and elsewhere testify to this. Mr. Hayward also contributes articles on some phases of *Amaryllis* culture in this issue.

The cover design of this GENERAL AMARYLLID EDITION of HERBERTIA shows *Sternbergia lutea*—based on a photograph taken by Sam Caldwell of Nashville, Tennessee.

There are various articles on AMARYLLIS in this issue. Mr. Hayward writes on cold susceptibility of *Amaryllis;* cold storing *Amaryllis* seeds, and *Amaryllis* propagation problems. Prof. Nelson, Mr. Hannibal *et al* report on *Amaryllis ambigua;* Prof. Nelson *et al* give further information about *Amaryllis evansiae.* Jack Scavia writes about a new round-flowered double *Amaryllis* such as breeders have been seeking for many years since the older doubles are usually too irregular in flower shape. Mr. Weil writes about the effect of colchicine on *Amaryllis.* Beckwith D. Smith contributes an article on his hybrid *Amaryllis;* Mrs. A. C. Pickard writes about the smaller (intermediate) hybrid *Amaryllis.*

In this issue, as is customary, other amaryllids are not neglected. Dr. Corliss reports on amaryllids seen on his 1957 European Tour; Mrs. Morris Clint concludes her interesting article on collecting amaryllids in Texas and Mexico; Beckwith D. Smith writes about his visits with amaryllid enthusiasts in Louisiana and Texas.

There are articles on the chromosomes of *Lycoris* species by S. Bose; on *Nerine bowdenii* variations by L. S. Hannibal; on fertile clones of *Lycoris* radiata by Wm. L. Hunt; on *Lycoris elsiae,* on hybridizing *Lycoris,* and on a new hardy golden *Lycoris* by Sam Caldwell; on more of his amaryllids by Reg. F. Harradine; on the control of the major bulb fly by Dr. Jos. C. Smith; on Sternbergias by Wm. L. Hunt; on *Paramongaia* by Dr. Jos. C. Smith and Mrs. Morris Clint; on germinating seeds by L. S. Hannibal; on *Agapanthus* and an old white *Crinum* by Wm. L. Hunt; on *Hymenocallis* by Dr. Jos. C. Smith; and on seed setting in *Sprekelia* by S. Bose and Dr. Flory. Three new *Amaryllis* species and two new *Lycoris* species are described; crosses in the tribe *Zephyrantheae* are reported, and a robust form of *Crinum americanum* is described.

There are reports on the 1957 Amaryllis shows in New Orleans, Louisiana and Mobile, Alabama; and other reports on local Amaryllis organizations in Dallas, Texas and Hattiesburg, Mississippi, and still other contributions as shown by the table of contents.

Since the death of J. Marion Shull, who ably served as artist for the Society, there has been a need for some one to take his place. Mr. Douglas D. Craft, Instructor in the DEPARTMENT OF DESIGN, ART INSTITUTE OF CHICAGO, has kindly agreed to assume responsibility for design problems, particularly the covers of HERBERTIA. Mr. Craft is an *Amaryllis* enthusiast who will contribute his first article in the 1959 issue of HERBERTIA.

Contributors to the 1959 issue are requested to send in their articles by August 1, 1958 in order to insure earlier publication of this issue. Unless articles are received on time, publication will be delayed to June or July as with other issues in the past several years.

March 15, 1958,
Camino de la Costa,
La Jolla, California.

Hamilton P. Traub
Harold N. Moldenke

CORRIGENDA

PLANT LIFE, VOL. 13, 1957

Page 1, title page, change "23rd issue" to "24 issue".

Page 2, 1st paragraph, line 1, change "23rd" to "24th".

Page 4, 2nd line, change "24th" to "25th".

Page 43, Table 1, under the first "2a", change the second "2a" to "3a".

Page 82, under Tribe 14. Euchareae, between "84" and "85", insert "84a". PSEUDOSTENOMESSON (1 sp.) x=?"

Page 83, 4th and 5th lines from the bottom, for "250 5th Ave., New York" read "120 Alexander St., Princeton, N. J."

Page 92, under L. S. Hannibal article, 3rd line, change "rerooted" to "reported".

Page 98, caption, Fig. 29, between *"Brunsvigia* x *multiflora"* and "Lindl.", insert "which is similar to *B. grandiflora."*

Page 144, Table 1, *Z. Elliottiana,* Mookerjea (1955), change "32" in fifth column to "28".

Dedicated to
Wyndham Hayward

Herbert Medalist—Wyndham Hayward

Plate 1

WYNDHAM HAYWARD

An autobiography

Without doubt a vacation trip to Cuba in 1926, while working on the editorial staff of the Providence Journal and Evening Bulletin, led directly to a horticultural career for the writer of this brief autobiographical account. It was while stopping in Jacksonville, Miami and other cities on the East Coast of Florida, that the exotic beauty of native and introduced tropical and sub-tropical plants seen in wayside plantings, streets, parks and so on, began to cast their spell.

The next season (1927) there came to the writer's family the possibility of moving to Florida, making an exchange of the home place in Wickford, R. I., for a house and lot with abundant citrus trees in Orlando, Florida. After three years on the staff of the Orlando Sentinel in various capacities, came the depression, which hit Florida sooner than the rest of the country with the early collapse of the land boom of the 20's, and there was born a new horticultural career.

The need for raising meat and vegetables may have had some part in this change, and for the next decade it was a life of gardening with special emphasis on bulbs, tubers and tuberous rooted subjects as well as fruit trees and other exotics and ornamentals. High spots of the period were the farming of two acres of muckland in 1932-34, growing vegetables and flower bulbs, etc., the raising of hundreds of chickens, ducks, turkeys, and finally the founding of Lakemont Gardens in Winter Park in 1934.

On my father's side, one widowed great-grand mother managed a farm in Rhode Island, my father was a garden enthusiast, with special feeling for fruit trees and vegetables, while a newspaper man by profession. In my own case besides a natural love for plants there was little to point to a horticultural career beyond the winning of a five-dollar gold piece in boyhood for having the best vegetable garden along about the 5th grade of school. But in Florida the presence and meeting of such inspiring plantsmen as Theodore L. Mead, Henry Nehrling, M. J. Daetwyler, Mulford B. Foster Dr. Hamilton P. Traub, Dr. H. H. Hume, Dr. David Fairchild, Dr. P. H. Rolfs, Prof. E. L. Lord and others, made a gardening career a foregone conclusion.

Born Oct. 25, 1903 in Providence, R. I., and raised in Providence and the little fishing village of Wickford, R. I., on Narragansett Bay, a small community in the best tradition of Old New England, the writer attended elementary and grammar schools in Providence, and high school at Wickford, (North Kingstown High School). After finishing the classical or liberal arts course at Brown University, A. B. 1924, there was one year of graduate study at Harvard University, majoring in comparative philology, with major fields in Romance, Semitic and Indic languages, where he received the Master of Arts degree in June 1925. At Brown he was elected to Phi Beta Kappa in 1924.

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Five years of newspaper work followed in Providence, R. I. and Orlando, Florida, with resulting slight opportunity to accumulate background material toward a life in scientific gardening. Thus the last quarter century and more has been a period of further abundant study and learning, with help, instruction and encouragement from many prominent authorities in the fields of plant science and plain "dirt gardening".

At present the writer owns and operates LAKEMONT GARDENS, specializing in bulbs, tubers and tuberous plants, at Winter Park, Florida, where he has lived at 915 South Lakemont avenue with his mother, Mrs. Emma L. D. Hayward, herself a life-long flower lover, for the past 23 years. She is 86 years old at this time, (April 1957) and still maintains an active interest in the affairs of the business and its plant stock and operations.

A common interest in Amaryllis led to the organization of the AMERICAN AMARYLLIS SOCIETY (which is now affiliated with the American Plant Life Society) in 1933 in cooperation with Dr. Traub (then stationed at the Orlando, Fla., UNITED STATES DEPARTMENT OF AGRICULTURE STATION), Judge E. G. Duckworth and Mr. Ralph W. Wheeler. The writer was secretary during most of the formative years, the continued growth of the Society has shown its sound purposes and helpful functions through the past quarter century. Its yearbooks comprise the greatest accumulation of general information and scientific data on the Amaryllis family ever published.

Besides *Amaryllis* and the other amaryllids, the writer's interests at Lakemont Gardens have included important cultures of *Gloriosa* species and hybrids, various "Ginger Lilies" *(Kaempferia, Hedychium, Zingiber, Curcuma,* etc.), *Achimenes,* one of the leading commercial collections, *Hemerocallis* hybrids, Crinums, Caladiums, *Haemanthus, Tacca* species, etc. Catalogues of the various specialties have been issued with remarkable irregularity, and mailing list of many thousands of plant lovers all over the world evolved.

Perhaps as the result of his journalistic experience, the preparation and publication of numerous more or less extended papers and articles on various phases of the horticulture of bulbs and tubers came naturally and has continued through the years. If there has been any mission to it all, this sincere and earnest effort to spread abroad the charm and appeal of worthy plant material, familiar and exotic, old and new, will have to stand as our contribution to the entertainment and instruction of the great gardening public. It has brought the rich, rewarding experiences and friendships.

VISITING AMARYLLIS ENTHUSIASTS

BECKWITH D. SMITH, *Jacksonville, Florida*

My wife and I had begun to give more and more consideration to the remarks of Horace Greeley when our only son wound up his college term in Texas by marrying a native Texas girl. This impulse to "Go West" was further stimulated when the family began to grow with the addition of two darling little girls—and, when I read of the organization of an Amaryllis Society in Houston, Texas in the 1957 Herbertia, and remembering that along the way in Louisiana there were many ardent Amaryllis growers, the fever to make the trek got the best of us and we determined to go.

So, early on the morning of October 19, 1957, my wife, Mary Louise, and I, set out by car on a memorable visit. We planned our route through Mobile, Biloxi and Ferriday, planning to reach Houston the afternoon of the 21st. We were successful in reaching Biloxi, Mississippi that night and stopped for rest at a motel, with the sound of the lapping of the Gulf waters in our ears, lulling us to sleep.

Refreshed, we again got a new start the next morning, setting our sights on Ferriday, Louisiana, where we were to call upon Mrs. U. B. Evans at famous old Haphazard Plantation. Our expectation had been to reach that point around noon, but we encountered an unexpected delay. Somewhere along U. S. 90 we had taken a wrong turn, and by the time we had discovered our error we had penetrated too far into southern Louisiana to turn back. Since by this time my wife had appointed herself "Navigator", and was carefully studying an assortment of three tour maps, we decided to keep on. So we spent several rather uncertain hours meandering toward northern Louisiana, and Ferriday. During this time we crossed and criss-crossed the Mississippi and Louisiana lines so many times we were about ready to take out naturalization papers in one state or the other. However, even misfortunes of this nature will come to an end and we did reach Natchez, Mississippi about one thirty in the afternoon.

Now, discovering that Natchez was just across the Big River from Ferriday, we sped over the bridge, reached Ferriday and called Mrs. Evans. Mrs. Evans directed us to Haphazard, which was about ten miles west of Ferriday, and soon we were driving up through fallow cotton fields to the 'Big House'. Mr. and Mrs. Evans greeted us at the gate as we drove in the yard and we were ushered into a spacious living room and extended a most courteous welcome. I noticed first off the large fireplace, in which burned with cherry flame a log that measured all of six feet long.

The conversation immediately got around to Amaryllis. We then discovered that Mrs. Evans was the sister of Mrs. John Blow, a resident of Jacksonville, and a friend of ours and an Amaryllis fan. When we informed our hosts that this was our first trip west of Mobile, they told us much of the history of their State. We were introduced to the heavy pleasure of homemade 'dark' Louisiana coffee, which neither of us had savored before, and it made quite an impression. In fact, thereafter when we were served this heavy coffee, I always received a suprise at its vigor.

While the coffee was being served, we showed our kodachrome slides of Dutch Amaryllis grown in our garden at Jacksonville and those of the John T. Weisner collection (previously reported on in HERBERTIA) grown at Fernandina Beach, and which we acquired in the spring of '57. Mr. and Mrs. Evans then showed us their colored slides of some of the Bolivian Amaryllis which had been collected by Professor Ira S. Nelson, of Southwestern Louisiana Institute at Lafayette, on his plant expedition in 1954. These outstanding slides included the yellow form of *Amaryllis evansiae* (named in honor of Mrs. Evans, who so actively sparked this plant exploration), various forms of *A. Belladonna* L., including pink, salmon, mandarin red and scarlet, with throat color ranging from whitish to greenish-whitish. We were, of course, stunned and amazed at the beautiful color variations in *A. evansiae,* which is predominantly yellow. Here, at last were the visual proofs of which I had read in HERBERTIA, and there was yet more in store!

After viewing this wonderful collection of color slides we were shown into the garden, and there before us were the actual same bulb plants growing in the rich organic soil on the banks of a most attractive lake. The sides of the banks were also planted with thousands of Louisiana Iris, and these grew in the same wonderful earth. As we walked from bed to bed, Mrs. Evans pointed out to us bulbs of Dutch origin which she said had been growing in their beds for ten years or longer. Some of these were truly massive in size, and we were informed they produced giant spikes of the finest flowers in solid, pure colors. In other beds there were growing the Bolivian types, such as the yellow *A. evansiae, A. x johnsonii,* A. pardina Hook. (the red-spotted Leopard Amaryllis), a hybrid known as 'Cuenca', *Rhodophiala bifida;* numerous types of *Habranthus* and *Zephyranthes,* and many Crinums. It was a literal feast to see these magnificent bulbs in growth, and so happily naturalized in the Louisiana soil, far from their native Bolivia. Only the fleeting passage of time forced us to cut short our visit and tear ourselves away from this idyllic setting, and we reluctantly made our adieus and departed for Alexandria, where we were to spend the night. Naturally we will always remember Mr. and Mrs. Evans, not only for their graciousness and kindness to us at their home, but also for their unstinted generosity in sharing some of these fine Bolivian bulbs for growing trials in the sandy soil of Duval County, Florida.

The next morning, October 21st, we departed Alexandria, proceeding into Texas without incident and reached Houston in the middle of the afternoon. Having already written ahead to Mrs. A. C. Pickard, Regional Vice-President of the AMERICAN AMARYLLIS SOCIETY, and organizer of the Houston Branch of the Society, we had a call waiting for us, and contacted her when we could get our breath after a rousing reception from the new grandchildren (to us, that is), and arrangements were made to attend the meeting of the Society the next day. We later found out that we had arrived just in time for the second meeting of this fine new society. We then settled down for the balance of the afternoon and the evening to establishing relations with the two delightful little girls, one six and one three, and neither of which had been previously seen by me.

The morning of October 22nd dawned cool and a little rainy, but soon two members of the Houston Amaryllis Society (Mrs. Ray Williams and Mrs. Hughes) came for us and we reached the Garden Center where the meeting was to be held at ten o'clock. This was our first sight of Mrs. Pickard, and we found her to be a most attractive and energetic lady. We were introduced to all of the very interested members of the Society and I made a short talk on the culture of Dutch Amaryllis in Florida, discussing soil, growing procedures and the increase of bulbs from seed, and propagation from cuttage, as was previously outlined by Dr. Hamilton P. Traub in HERBERTIA. I called attention to the fact that their 'gumbo' soil was well adapted to the growing of *Amaryllis* with the addition of heavy sand and natural organic humus. A bulb was cut up as a demonstration. Some of the ladies expressed horror at the apparent ruin of a good bulb, but it was explained to them the example was one of the good old hardy Florida Mead strain, and they relaxed.

We found that the HOUSTON AMARYLLIS SOCIETY had organized with a closed membership of twenty-six persons, although Mrs. Pickard stated that after a time they would open membership to other people interested in Amaryllis. After the meeting, Mary Louise and I were guests of Mrs. Pickard and the members at a delightful luncheon, where all had a wonderful time discussing our favorite flower, Amaryllis. We stayed on in Houston until Thursday, October 24th, at which time we found it necessary to start our reverse trip to Florida. The time in Houston, both with our flower friends and with our children and grandchildren, passed all too soon.

Coming through lower or southern Louisiana, we were much impressed with the enormous fields of sugar cane, and were as well delighted and impressed with the curious charm of old New Orleans when we stopped in that city for a day. At many points along the way on our return trip we saw numerous field plantings of Amaryllis, but were unable to do much exploring for the purpose of discovering more about them.

After coming back to Jacksonville and resting from our driving, we decided to finish up our tour by visiting in our own state. So, a couple days later, or on October 29th, we drove to Tampa to see Miss Ruth M. Clark (prominent in the growing and development of hybrid Amaryllis), spending several hours in her pleasant garden. While seeking direction to her home, I was unhappily bitten by a small yard dog, and the bite was quite painful for several days. However, the dog was found to be in good health, and I did not have to submit to the unpleasant rabies treatment. We spent the night in Lakeland, and the morning of the 30th reached Winter Park. Here we were to call on Mr. Wyndham Hayward, at his wellknown Lakemont Gardens. It was not a too busy day for this very pleasant gentleman, so he took considerable time with us and showed us all over his gardens and growing grounds, and we spent the time most happily. We would urge all Amaryllis fans visiting Florida to be sure and go to see Mr. Hayward if you want to obtain the very finest in Amaryllids to be had in Florida. He is a grower of the highest type, and his gardens are fabulous, to say the least. Here the grounds are filled with tropical plants of all types and varieties beside Amaryllis. You will not only come away with your chosen bulbs or plants, but you are also bound to be happily infected with some of the effervescent enthusiasm which is a definite part of Mr. Hayward in his horticultural pursuits.

On our return to Jacksonville after our last call, we were even more enthused with the culture of Amaryllis than we had been before. Our contacts with other Amaryllis fans had been most rewarding, and we are now looking forward to a new season in the further development of our own Amaryllis in our own home garden. Why not come and see us?

COLLECTING AMARYLLIDS IN TEXAS AND MEXICO

Mrs. Morris Clint, *Texas*

[Concluded from page 83, HERBERTIA EDITION, PLANT LIFE Vol. 13. 1957]

Unfortunately, we have found all of these four numbers comparatively shy bloomers in cultivation. Perhaps it is their nature or they may need more time to become acclimated or maybe I have not yet solved the secret of their successful culture.

Just a few miles beyond this point, Morris saw a lone yellow *Zephyranthes* on the shelf above the road. It was a little brighter in color but apparently the same species we had collected south of Jacala the year before, M-449. We collected more bulbs in leaf from the ditch below and when they bloomed later in the year, we were not too surprised to find one of the yellow and red forms among them. The final chapter of the mixed collections from the Jacala area was about to unfold, for about a mile north of Jacala we discovered a heavy stand of bulbs which had just finished blooming. At first, we supposed they must be the yellow and red form, but were puzzled that the faded flowers were bright rose red and not a dull, dark red. At Puerto de la Zorra the same bulbs were found in some abundance and a few freshly opened flowers showed us that they were a bright rose red with a small white throat and long tepaltube. Remembering the tiny seedlings of M-466, I now strongly suspected that most of our two former collections of narrow leaved bulbs from Puerto de la Zorra were this filiform leaved species, M-569. A few rose red blooms later in the summer on these collections seems to prove me correct. So, within a 10 mile radius, in addition to the larger bulbs we have three small forms—two of which I feel sure will be classed as distinct species. To one not familiar with the tropical habitats of these small amaryllids this would not appear plausible, or even possible. Normally, growth and blooming habits in the wild of each species and even the various forms within a species vary from one another, yet all are so dependent on the unstable and unpredictable seasonal rainfall that it is frequently possible for the normal blooming seasons of two distinct species in a given area to overlap to some extent. On the other hand, due to the same inconstancy one is never certain to have found a true picture of the populations of a given area even though frequent visits through successive seasons have been made.

In June, 1955, we scheduled a trip which was to take us to Antiguo Morelos, San Luis Potosí, Guadalajara, Morelia, Salamanca, Zimapan, Cuidad Valles and home. Our daughter, Marcia, went with us. The light yellow *Zephyranthes* near Nuevo Morelos were heavily in bloom over the entire valley and what a beautiful sight it was! As we started up into the mountains on the other side of the valley, we stopped to examine a group of pink *Zephyranthes.* These were a familiar form, but a closer look made me exclaim with incredulity, for just a foot or so away was a clump of the yellow flowering *Zephyranthes.* Seldom does one actually witness such a phenomena—the chance mingling of the bog and the mountainous species.

About 40 or 50 miles from San Luis Potosí, we ran into one of the most severe rain and hail storms I have ever witnessed. It was a nerve-wracking but unforgettable experience. Within 10 minutes the desert was white with hailstones and angry torrents of muddy water and floating hail ran in the ditches and crossed the highway at frequent intervals. Rain and hail hit the windshield with such force that vision was completely obliterated and only Marcia's directions from the rear kept us on the road, while we crept along at only a few miles an hour. As frightened as we were, we couldn't help but wonder what bloom the storm would bring forth.

The next day, as we drove onto the plateau south of the city, we found scattered blossoms of *Z. concolor.* One group had extra large, wide open flowers with very narrow tepalsegs. It was the most distinctive variation in the species we had so far seen. Much farther south one lone blossom of *Z. concolor* placed the species well within the state of Jalisco.

We owe our next collection to an amusing co-incidence. We were about 5 miles south of Lagos de Moreno, Jalisco and were teasing Marcia about our ability to judge just where *Zephyranthes* might be found. Pointing to a dry, sandy slope I said, "Why, for instance, there is a place right now", and had to wipe my eyes, and look a second time, for there they were, indeed! Though the slope was literally covered with tiny, pale pink blossoms, we would ordinarily never have seen them if the sun had not caught the blossoms just right, for they were blooming on stems so short that often the flowers were resting on the ground. We think we have collected this number, M-599, in a number of places on the plateau.

As we approached closer to Guadalajara, we began to suspect that we were too late to find *Zephyranthes* in bloom, for rainfall had been heavy and frequent over most of the countryside. However, the next morning we found quite a group of blooming bulbs on highway 15, about 20 miles east of Guadalajara. The terrain was fairly level, but rocky. We had been hoping to find *Z. fosteri* but these bulbs did not quite seem to qualify, for the large, rather spidery flowers of bright rose were borne on a short pedicel. This number, M-602, reminded us somewhat of M-557 from the Canyon de Borregos. This collection kept us on sharp look-out and frequent stops were made, but we were sorely disappointed not to find more *Zephyranthes,* even in leaf. About 60 miles from Guadalajara, in the hills above Lake Chapala, one of our stops payed dividends, for we did find amaryllid bulbs—a heavy concentration of them among the lava rocks along the roadside. But what were they? Not *Zephyranthes* and certainly not *Sprekelia.* I do not know whether we would have guessed them to be *Hymenocallis* had we not found a few bloom scapes, for the narrow, glaucous leaves were unlike any of this genus that we had ever seen. When a few of the bulbs bloomed in our garden a few weeks later, we were completely enchanted with the dainty umbel of small, delicate blooms. We sincerely hope that this lovely dwarf species will take kindly to cultivation.

The next morning we found a few small pink *Zephyranthes* on a rocky hillside along the highway from Morelia to Salamanca. We were about 10 miles north of Morelia, in the state of Michoacan. The flowers were similar to M-599, collected the day before, except for one bulb, a very large, starry white blossom. It was the only one seen, although we spent some time searching for others. Two miles farther, in the flat, rocky soil of one of the valleys not far from Lago de Cuitzeo, we again came upon *Zephyranthes.* M-609 were large, robust bulbs with pretty white flowers with broad tepalsegs. The ovary seemed to be completely sessile, so they may prove to be a form of *Z. verecunda.*

In the state of Queretaro, it was Marcia who spotted the bright red ''Mayitos'' along the roadside. We soon discovered that the nearby hill was simply covered with blossoms—dark red, a larger flower of pink and a few of the familiar small pink. The red, M-611 and the pink, M-612 are probably forms of the same species. There was not a sign of bloom on identical hills in the neighborhood and we marveled at the erratic showers which could bloom *Zephyranthes* on one hillside and leave the very next one bare. We have traveled enough to know that it is a frequent occurrence, particularly at the beginning of the rainy season. On the plateau, it is easy to observe the formation and movement of these sudden rain squalls and we have often been amazed at the narrow paths taken by even the heavy showers.

We had hoped to find a few blooms on the large flowered bulbs in the mountains between Zimapan and Jacala, but nature and the temperamental habit of the bulbs were against us, for there was no sign of them, either in leaf, bloom or seed.

In July, 1955, we again took the loop to San Luis Potosí, Guadalajara, Morelia and Zimapan—to examine the flowers of a species of *Hesperaloe* near Cuidad del Maiz, to find flowers or seed of the Lake Chapala *Hymenocallis* M-604 [Fig. 6]* and perhaps to locate more *Zephyranthes* in leaf on the southern route. We arrived at El Mante early enough in the afternoon for a short scouting trip out the Tampico highway. We found a single small yellow *Zephyranthes* in bloom in the deep bar pit along the roadside and collected a number of others which had bloomed earlier. When these bloomed in our garden in the fall, we discovered that they were close to the small forms of *Z. pulchella.*

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* Fig. 6 (see 1957 **Herbertia**).

As we drove through the mountains just west of Maiz our attention was attracted by numerous shrubs with large clusters of dark blue flowers and were quite surprised when we recognized them to be Cenizo. It was raining, so we did not stop to examine them thoroughly. The *Hesperaloe* blossoms were disappointingly drab and unattractive for such beautiful plants and the continuing rain would have kept us from lingering, but we were completely astonished—though by now we should be immune to astonishment concerning the habits or habitats of *Zephyranthes*—to find the ground literally carpeted with *Zephyranthes* in full leaf. They had bloomed and leafed out in the short interval since our last visit to this spot. We fully expect these, M-633, to be the same as our M-469, collected in the foothills a few miles farther east, but who knows?

When we visited our *Z. concolor* collection site 14 miles north of San Luis Potosí, we found we had just missed a heavy bloom. Present in small numbers was a bulb we had failed to see on our many previous visits—M-643. The bulbs were large for the "Mayitos" of this area (which excepts *Z. concolor),* with a mass of dull green leaves about ¼ inch broad and large seed capsules on quite a long pedicel. The dried remains of the blossoms indicated that the flowers were rather large. They are not quite like anything we had collected in this region, but will they actually prove to be a new number for us, or are they one of our old friends transformed by the different environment of this rain strip?

The next morning, we stopped in the foothills just south of the city of San Luis Potosí, hoping to find bulbs of M-429, a very large, rose blossom we had collected in May of 1954 in scarce numbers and had not seen since that time. We hope that we found them in the heavy concentration of large bulbs with bright green, broad, decumbant leaves—almost the only *Zephyranthes* above ground.

We again took the side trip to our "Bulbous Paradise" on highway 45. The *Oxalis* which had carpeted the fields in June were gone, but the Tuberose-like plants were in full bloom, in several shades of peach, pink and white. The flowers are much prized by the Mexican people, who were in the fields gathering them by the armsful. We were told that they were called "Nardos", which is one of the names given to the Tuberose. While they are still to be properly identified, we assume they are a species of *Bravoa,* the Mexican Twin-flower. We found M-460 in full growth, while hardly a bulb of M-459 was in sight. On the way back to our highway to Guadalajara, Morris saw *Hymenocallis* blooming in a broad, natural drain, far below the roadbed. To our surprise and delight, it was apparently our Lake Chapala species. We found numerous bulbs in the grass, a few in the last stages of bloom and a number in seed. Also present in some abundance was our M-460, heavily in seed.

Not far from Guadalajara, it began to rain but this failed to restrain us when a heavy stand of *Hymenocallis* was spotted in a small ravine far below the roadbed. The bulbs, M-658, were growing in large clumps along a small, rocky stream. Far different from the Lake Chapala species, the plants had long, narrow, upright leaves of dark green. A few old scapes were bulging with seed. We found that the larger bulbs were firmly anchored among the large rocks and were almost impossible to dislodge, but we were able to dig most of a large group of small seedlings. Not many miles south of this spot, we saw our dwarf Lake Chapala species in bloom in a shallow ditch along the roadside.

Our luck in finding *Zephyranthes* in leaf along highway 15 was no better than in June. At our original collection site of the Lake Chapala *Hymenocallis,* we learned that the plants had bloomed, shed their seed and were already beginning to go dormant. We talked with an old woman who stopped as we were busy locating seed among the rocks and heavy weed growth. She volunteered the information that early in the season the roadside in the immediate vicinity was colorful with red ''Tempranillas'', so perhaps we are at last on the trail of *Z. fosteri.* Fortunately, we had learned a year or so earlier that *Zephyranthes* are called ''Tempranillas'' in the state of Jalisco and not ''Mayitos''.

The Lake Chapala *Hymenocallis* was seen in flower once more in the state of Jalisco and twice in the state of Michoacan, one of the latter locations being not far from the state of Guanajuato, so the range of the species is far more extensive than we would have supposed on our trip in June.

While visiting the collection site of M-456, we learned from an old man of an even larger colony of the bulbs some distance away. These bulbs, growing in a caliche outcrop, were even larger in size than those formerly collected. We secured more information concerning the species from an old woman who had arrived to collect faggots. She stated that there were scattered colonies of bulbs on all of the adjacent hills in the immediate vicinity and that they bloomed at intervals with the first rains of spring, having a large white blossom. If her story is correct, this is one location where only one species of *Zephyranthes* is to be found, for she claimed that the only other bulb that she knew of was the white ''Estrella'' *(Milla biflora).* Yet it is but 14 miles farther east to the red hills of Queretaro where we collected the three forms of ''Mayitos'' in June!

At Puerto de la Zorra, we found the large, pink flowered bulbs, M-365, in full leaf and were a little surprised at their abundance. We have never found the glaucous #M-565-A at this location nor had we seen it anywhere from Zimapan northward on this trip, in spite of many stops and careful searching. We found masses of the yellow and red *Zephyranthes* M-665 in heavy bud, growing in pure leaf mold on a rocky ledge at Puerto de la Zorra. There must have been several hundred bulbs in an area less than 2 feet square. Among the bulbs collected for us by a small boy who was tending cattle in the neighborhood we sorted out four or five which looked different from the above. These bloomed for us shortly after our arrival home and they happened to be the pure yellow form, which places all three of the small bulbs at this location. A violent rainstorm came up about noon, so we ate lunch in the car and were on our way at the first break in the rain. Even so, we drove through dense fog for the next 50 miles, so were robbed of further collecting.

We are now in our tenth year of plant exploration in Mexico and as the *Zephyranthes* season is almost upon us once more, I am reminded of the many courtesies we were extended by the representatives of the Mexican Department of Agriculture and the thoughtful co-operation and careful treatment of our plants and bulbs at the Plant Quarantine and Fumigation Station of the U. S. Department of Agriculture, both at Brownsville and Laredo. We hope to continue these explorations, adding some new territory each year and at the same time carry on the study of the populations of *Zephyranthes* in areas we are familiar with.

In conclusion may I say that in spite of the many amaryllids we have collected over the states of Tamaulipas, San Luis Potosí, Jalisco, Guanajuato, Queretaro, Hidalgo and Michoacan, we feel that we have barely scratched the surface, even in the areas we have covered. I am sure that the reader will agree. Many rumors, as yet unverified, have come to us of bulbs which can only be amaryllids of some sort: large white flowers with pink centers which have a delightful fragrance and are found only in an inaccessible and uninhabited lava region in the state of San Luis Potosí; our own ''Blue Phantom'' from the same state; very large and beautiful white flowers from the upper plateau near the city of San Luis Potosí; large red flowers high in the mountains of the state of Hidalgo and others ''mas azulito'' in the mountains farther north in the same state. Fact or fantasy, we listen to all of these tales with an open mind and have high hopes of running at least some of them to earth.

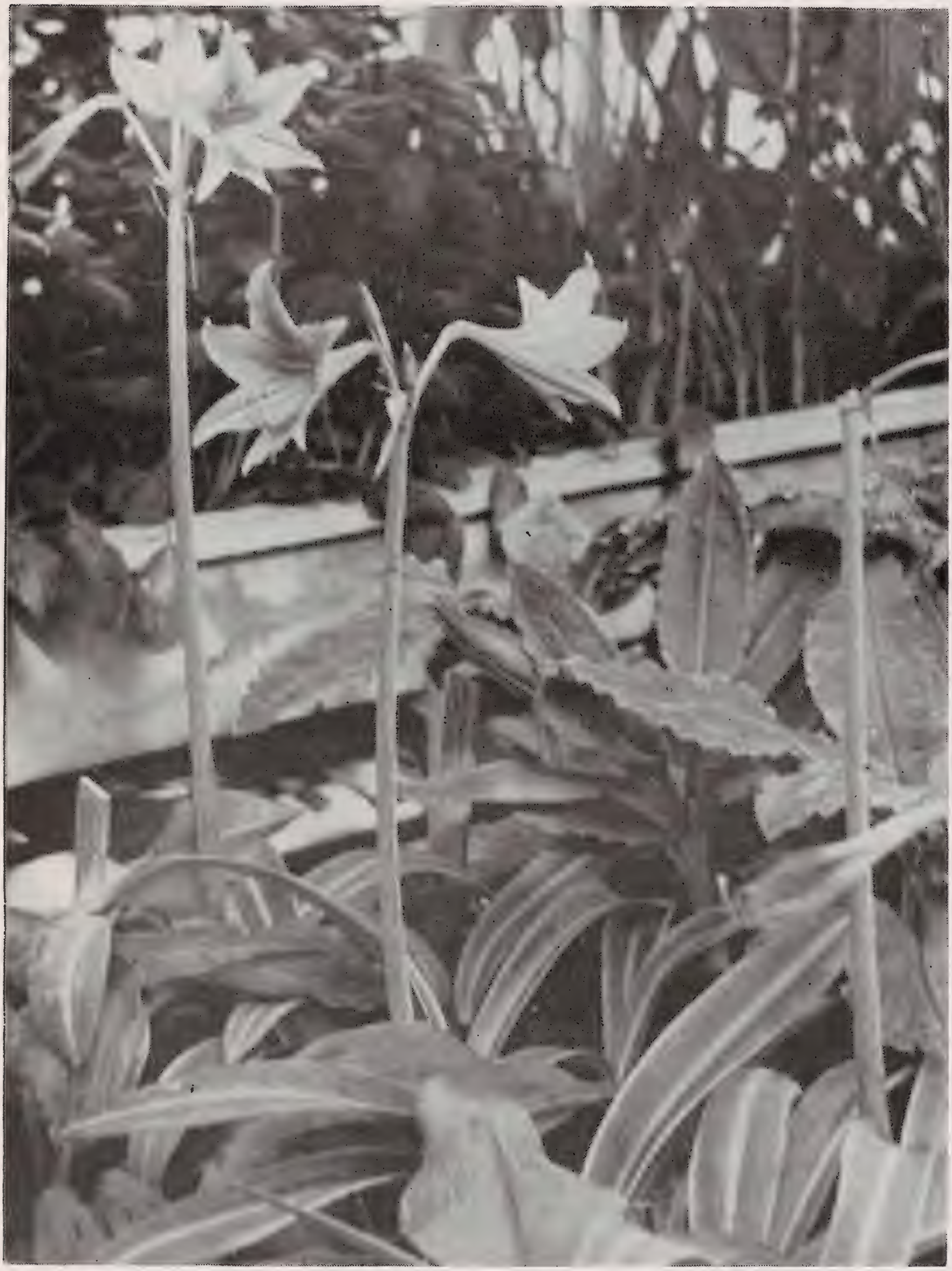
ALONG THE AMARYLLIS TRAIL

Philip G. Corliss, *M. D.*,
Regional Vice-President

Enjoying friendly contacts with leading plantsmen of the world has been one of the most rewarding facets of my labors as 'Leader' of Garden Tours for Arnold Tours of Boston. The Fall Gardens Tour of 1957 was particularly rich in items of interest to amaryllis enthusiasts.

On Saturday, September 7, we attended the great Aalsmeer Flower Festival in the Olympic Stadium at Amsterdam. The next morning Mr. H. T. N. van Woesik of the firm of Ludwig and Co. called at our hotel, the Old Castle Wassanaar (near The Hague), and drove us to the National Dahlia Exhibition at Hillegom. Before visiting the dahlia show in the new 'Treslong' building we enjoyed a tour through the adjacent facilities of Ludwig and Company. Although it was not the season for peak amaryllis bloom, we found much to admire.

Mr. Jansen, of Ludwig and Co., has been breeding for picotee amaryllis for many years. We saw several fine seedlings of this type in bloom with a red pencil stripe edging the otherwise pure white segments.



Amaryllis reticulata var. *striatifolia* hybrid at Van Tubergen & Co., in 1957. Photo by Dr. Philip G. Corliss.

Plate 2

A perfect picotee—the edging complete and no other color on the flower —has not quite been reached but the achievement seems imminent. However, the firm believes it will be another ten years before it markets a picotee amaryllis which suits their requirements.

I was astonished to see that in propagating their named amaryllis varieties they often make as many as seventy cuttings from each mature bulb using the method developed by Dr. Traub and Mr. Heaton and reported, in past issues of HERBERTIA. When I said that I would lose (and have lost) all the parts were I to attempt such surgery, I was assured that they sometimes did, too. Their 'Five Star General', in fact, was for several years quite obstinate about propagating—often only four or five of the segments would survive. Now the General is more tractable and responds well to being minced. They had to abandon completely what they considered the finest dark red amaryllis they had ever developed—it refused completely to cooperate in propagation.

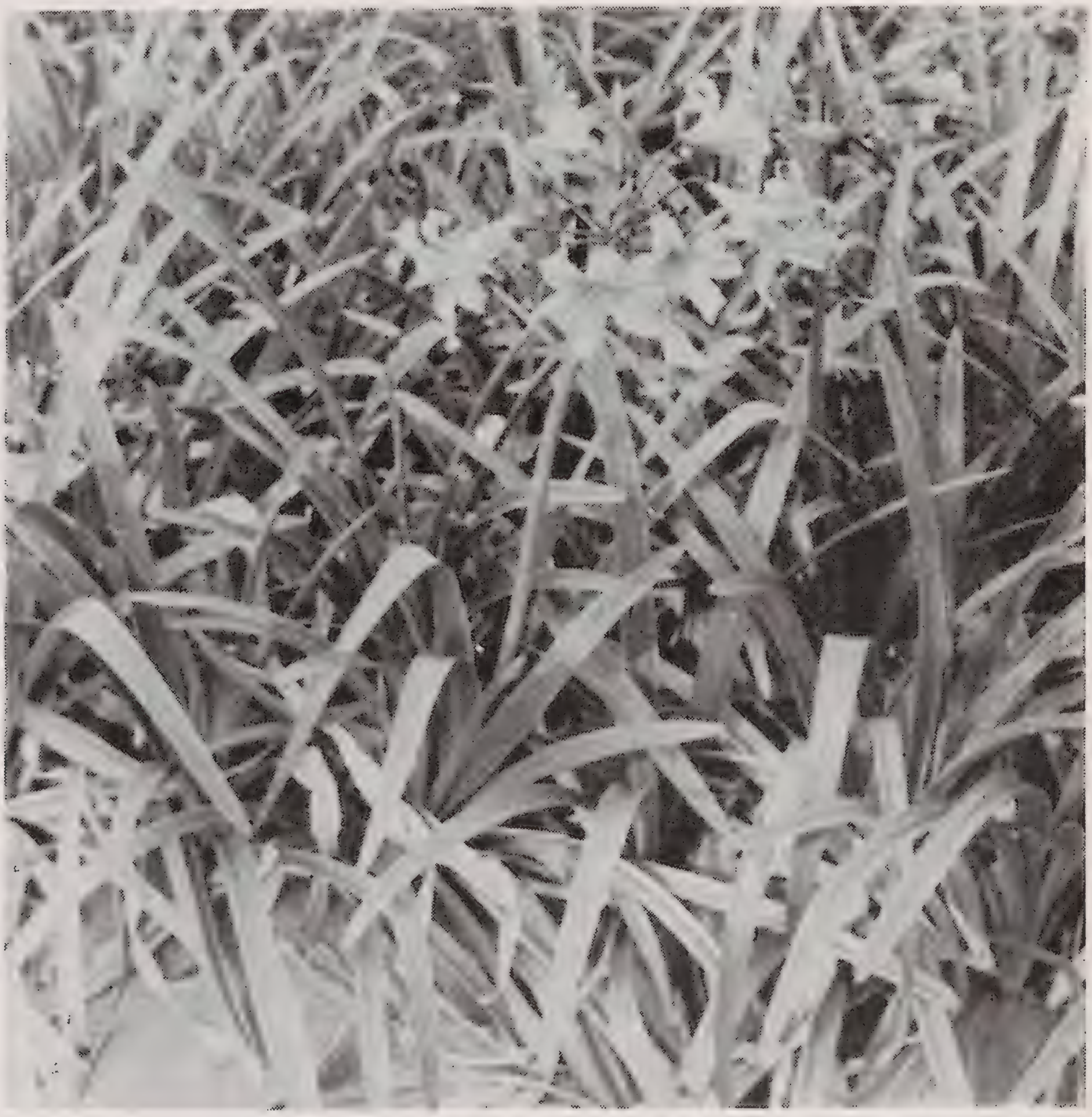


Fig. 1. *Nerine* x *Brunsvigia* hybrid at Van Tubergen & Co., Haarlem, in 1957. Photo by Dr. Philip G. Corliss.

The day after we enjoyed the Ludwig ranges and their benches of amaryllis we visited an entirely different kind of glass house at the Haarlem home of Van Tubergen and Company. These vast houses had no benches—the ones with amaryllids, at least—but served only as protection for bulbs planted in the ground.

Being unable to perpetuate nerines, or at least to bloom them more than the first year, but having *Brunsvigea rosea,* the Cape Belladona, pop up all over the garden every summer, I was delighted to contemplate future possession of an amazing hybrid of these two amaryllids. Blooming *WITH* handsome foliage were several scapes of *Nerine* x *Brunsvigea,* each umbel of which held some six or eight open flowers and ten to twenty additional buds (Fig. 1) The flowers of medium rose color were about as close to a mathematical mean in size between the two parents as one could imagine. Although further study will be required, I would venture a guess that these hybrids will prove of enormous garden value, succeeding where each parent may falter.

Our host at the Tubergen plant, Mr. J. Bijl, also showed us another amaryllid that was new to me. This was the large-flowered *Amaryllis reticulata* var. *stratifolia* hybrid (Plate 2). Notice the striped foliage which gives this species its name.

The final amaryllis treasure which rewarded our Fall 1957 trip was an handsome specimen which Mr. G. W. Robinson, superintendent of the Oxford Botanical Gardens, showed our group at the range at Oxford on Sept. 21. This was *Amaryllis aulica* x *A. calyptrata.* The outstanding feature of the flower is the intricate network of handsome raised veins on the tepalsegs. The blooms have bright rust-colored veins on petals of off-white; the green throat is dusted with brown.

DR. TRAUB'S "THE AMARYLLIS MANUAL"

WYNDHAM HAYWARD, *Florida*

The volume was received too late for an extended review of this great flower book, the first devoted exclusively to Amaryllis, in this issue of HERBERTIA. The full review will appear in the 1959 edition of HERBERTIA. The brief note follows:

The beginning of a new era of enlightenment in the scientific and popular study of Amaryllis, species and hybrids, may be said to have arrived on July 8, 1958 with the publication by Macmillan of Dr. Hamilton P. Traub's long-awaited "The Amaryllis Manual" *, a handsome, compact volume of 338 pages, with a remarkable color plate of the new miniature hybrid, *Amaryllis* x *henryae,* and 31 other illustrations. There is, of course, in this first great new work on Amaryllis since William Herbert's "AMARYLLIDACEAE", of 1837, a vast mine of horticultural information, scientific data and reference material, based on a lifetime of study of one of the world's great bulb genera, in the 16 chapters and five appendices. Amaryllis enthusiasts are hereby advised to run, not walk, to the nearest bookstore and place their orders for the long-awaited book.

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* THE AMARYLLIS MANUAL, by Hamilton P. Traub. The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. 1958. Pp. 338, including 32 illustrations. $7.50.

1. REGIONAL ACTIVITY AND EXHIBITIONS

NEW ORLEANS AMARYLLIS SHOW, 1957

MRS. WALTER R. LATAPIE, *Chairman*
Garden Circle, New Orleans

The Garden Circle's TENTH OFFICIAL AMARYLLIS SHOW was held on March 30th and 31st, 1957. In recognition of the event, a proclamation designating the period of March 30th to April 5th as "AMARYLLIS WEEK" was issued by the mayor. Forty garden clubs participated in the artistic arrangements and horticulture divisions. The Horticulture Divisions were also open to the general public.

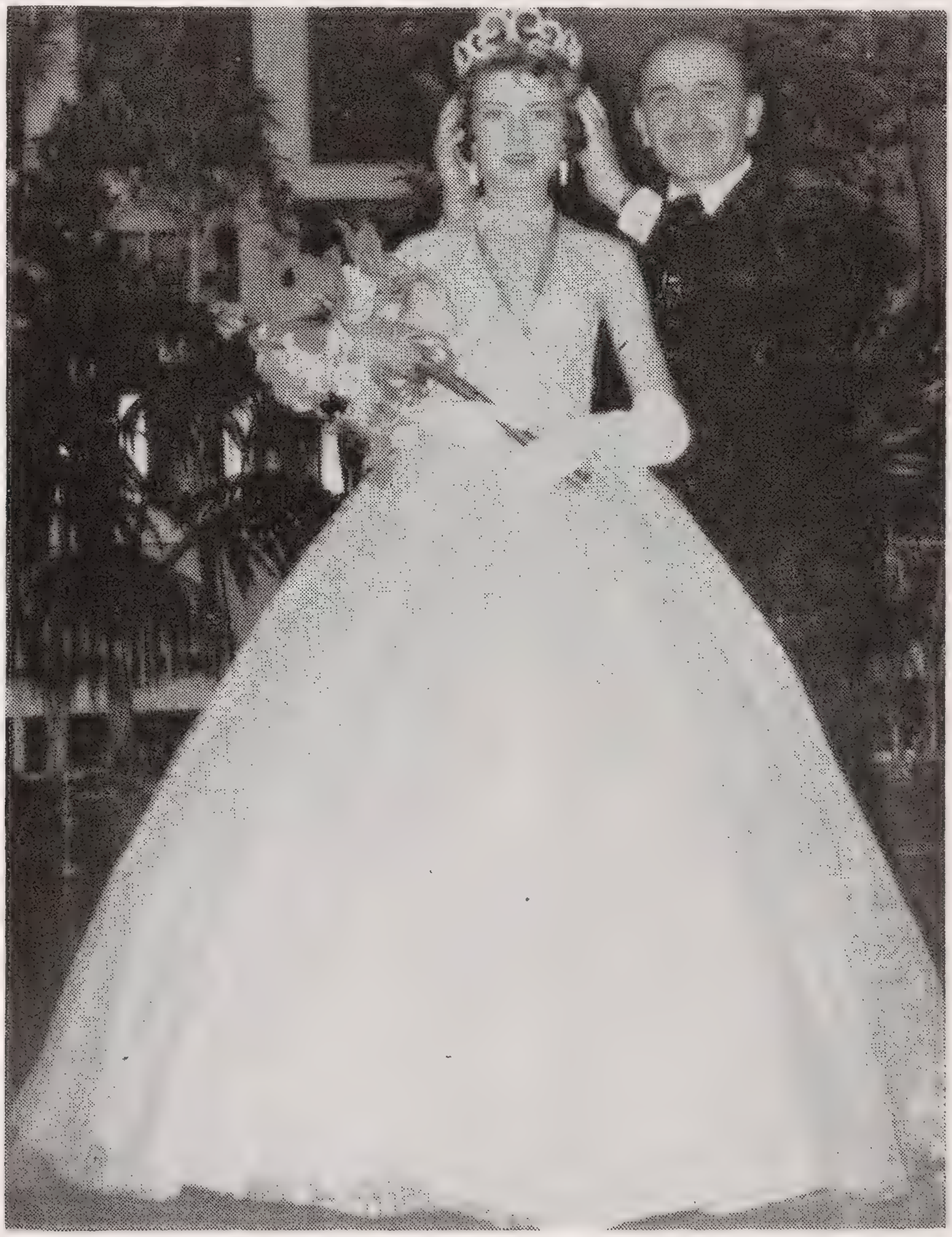

Fig. 2. Queen of the 10th Official Amaryllis Show, 1957. Miss Jeanne Wolfe is crowned by Commissioner-at-large, Victor H. Schiro.

The Show was judged by 15 Accredited Judges. Five Gold Cups (donated by the Garden Circle) and five AMERICAN AMARYLLIS SOCIETY awards, and numerous other gifts, were awarded. Mrs. A. Ducote Jr., of the Gentilly Garden Club received the Gold Cup for her artistic arrangement. The Dutch Horticulture Sweepstakes Gold Cup winners were Mrs. W. J. Perrin and Mrs. John Klein, Jr. Sweepstakes Gold Cup for American Horticulture was won by Mrs. Wm. Melder. Miss Donna Pence won the Junior Gold Cup. The Gold Cup for Public Schools was won by the Rabouin Vocational High School.

Amaryllis of all types are becoming more popular in New Orleans. However, there were more named Dutch entries in this year's show, than in the previous ones.

The Official Amaryllis Queen, Miss Jeanne Wolfe, was crowned by Councilman-at-large Victor H. Schiro (Fig. 2). Last year's Queen, Miss Joyce Lynne Nuss, presented the Maid,—Miss Judy Lee Centanni. The crown bearer was Miss Deborah Jefferson, and Miss Paula Jefferson was the Amaryllis bearer.

A great many people of New Orleans and vicinity enjoyed the Show, which was open to the public without charge.

GREATER GULF COAST AMARYLLIS SHOW, 1957

W. C. Strain, *President,*
Amaryllis Society of Mobile, Alabama

A floral treat was presented for garden lovers of Mobile, Alabama, Saturday and Sunday, March 16th and 17th, 1957, when the Amaryllis Society of Mobile, Alabama, presented the Fifth Annual Greater Gulf Coast Amaryllis Show.

''Amaryllis in a Southern Home and Garden'' was the theme of the show. Several thousand amaryllis enthusiasts visited the show and viewed the hundreds of specimen blooms and the many hobby tables, art exhibits and beautiful arrangements. The show was competitive and open to all whether members of the Amaryllis Society or not.

In addition to the ribbon awards, eleven sterling silver perpetual trophies were awarded to their winners. These trophies are perpetual except when won for three consecutive years by the same winner.

The program was divided into the following divisions; Horticulture (American Amaryllis); Artistic Arrangements; Horticulture (Dutch Amaryllis); Commercial; Hobby and Art.

Mr. Bill Robertson is President of the Amaryllis Society of Mobile and Mr. Ernest Thublin was show chairman. Mr. Thublin was ably assisted by Mrs. Robert Warth and Mr. William Lowe.

THE HOUSTON AMARYLLIS SOCIETY

Mrs. A. C. Pickard, *Regional Vice-President,*
The American Plant Life Society

The Houston Amaryllis Society was organized on August 1, 1957. The objectives of the Society are to foster closer cooperation of the members of the American Amaryllis Society in this area in the study and growing of Amaryllis through pot and garden experiments and the exchange of experiences at the meetings and garden visits, and to encourage the study of the subject through the available literature.

The Society meets on the 4th Tuesday of each month at 10 a. m. from August through May, excluding December. All members must include membership in the AMERICAN AMARYLLIS SOCIETY, and must engage in the growing of named Dutch hybrids. They are also encouraged to grow Amaryllis in the other divisions. The programs are given by the Society members, followed by a question and answer session. Our motto—a new Society should start with a good foundation. The programs begin with such subjects as ''Soil formulas for growing Amaryllis''; ''Primer concerning all phases of planting''; ''Member slide lectures''; ''Trends in Amaryllis breeding''; ''Technique of hybridizing''; ''Propagation—seed, offsets and bulb cuttage''; ''Culture and care after blooming''; and ''Disease, mites and insects of Amaryllis''.

Some of the members are accredited Amaryllis judges and we expect to have more by the end of next year. A capable judge must learn by growing.

The Houston climate is very favorable to outdoor Amaryllis culture. Our Dutch hybrids grow and like it. Some of our members' gardens are a paradise of named Dutch clones.

We hope by the end of the year with the full cooperation of all of our members to advance to a greater degree of usefulness and thus serve as an inspiration to Amaryllis lovers elsewhere.

MEN'S AMARYLLIS CLUB OF NEW ORLEANS

In September of 1957, the MEN'S AMARYLLIS CLUB OF NEW ORLEANS, affiliated with the AMERICAN AMARYLLIS SOCIETY, was organized at a meeting held at the home of W. B. Morton, Jr., 3114 State Street Drive, New Orleans 25, La., according to an announcement by Walter R. Latapie, one of the charter members. The group will devote its efforts to the advancement of Amaryllis culture, and it will cooperate with the annual OFFICIAL AMARYLLIS SHOW staged by THE GARDEN CIRCLE OF NEW ORLEANS. Meetings will be held the first Saturday of each month.

The officers are: S. N. Cuchinotto, President; H. P. Fontcuberta, Vice-President; W. J. Perrin, Recording Secretary; and Timothy Calamari, Corresponding Secretary.

HATTIESBURG (MISSISSIPPI) AMARYLLIS SOCIETY

Brief mention was made of this Society in 1957 Herbertia. The following is the roster of officers: Mrs. Sam Forbert, Pres., 117 North 23rd Ave.; Mrs. R. A. Fowler, Vice-Pres., 208 15th Ave., Mrs. J. H. Snowden, Secy, 321 South 16th Ave., Mrs. F. T. Newton, Treas., Monroe Road, and Mrs. Melvin M. Thomas, Reporter, 200 South 29th Ave.

Mrs. Forbert writes that the Society members order their Amaryllis bulbs more or less from Ludwig, Hillegom, Holland; when they arrive in February, they are planted in pots indoors until after blooming, then they are planted outdoors in permanent locations in the garden.

EDITOR'S MAIL BAG

Mrs. Jean Aldred, of the AUKLAND LILY AND AMARYLLIS SOCIETY, 23 Donovan St., Blockhouse Bay, Aukland, S. W. 3, New Zealand, writes that members of their Society are interested in corresponding with members of the AMERICAN AMARYLLIS SOCIETY.

Mr. Thomas R. Manley, of the Selingrove (Penna.) Area Joint Schools reports that several of his students are working on scape deformations under typical home culture of hybrid Amaryllis, and that the data will be published in a future issue of Herbertia. Like all of Mr. Manley's experiments, these results will surely be of vital interest to the members.

Mr. Bruce Hinman, Geneva, Illinois, writes that he gave up the commercial growing of Alstroemerias five years ago, but that he is still keenly interested in these fine plants, and hopes to grow them in the future as an amateur. He writes that he had produced some "most interesting seedlings which seemed to be *Astroemeria violacea* hybrids. These were in a variety of colors, including a beautiful, clear rose pink. I gave these roots all to Mr. Giridlian, of Oakhurst Gardens in 1952, but I have never heard whether any survived."

Dr. Corliss extends an invitation to members of THE AMERICAN PLANT LIFE SOCIETY to join the Spring and Fall Garden Tours which he conducts each year. For full itineraries, prices, etc., write to Arnold Tours, 79 Newberry St., Boston 16, Mass.

We are sad to report that Dr. Arlow B. Stout, Herbert Medalist in 1939, and Curator Emeritus of the New York Botanical Garden, died on Oct. 12, 1957, at his home in Pleasantville, N. Y.

We are sad to report that Mrs. J. F. Stewart, of Downey, Calif., died in January 1956. Mr. J. F. Stewart has sold his Downey place and now resides temporarily at Apple Valley, Calif. He has farmed out some of his best hybrid Amaryllis stock so that he can start again when he takes up permanent residence again.

Your editor received a stimulating visit from Prof. Ira S. Nelson of SOUTHWESTERN LOUISIANA INSTITUTE in the fall. Prof. Nelson is planning another plant exploration trip to South America in 1958 under the sponsorship of the LOUISIANA SOCIETY FOR HORTICULTURAL Research.

Mr. W. M. James, your Secretary-Treasurer, and Mrs. James, visited with the Editor in early November 1957.

Our good friend Rev. C. W. Hall, 1401 Wooldridge Drive, Austin 3. Texas, has retired as head of the WESLEY BIBLE CHAIR, and is devoting his time to gardening. His collection includes many Crinums. He has a surplus of a few kinds which he would like to sell or exchange as an aid in securing others.

Mr. R. Latti, Prop., Lily Nurseries, Box 25, Nuweplaas, C. P., South Africa, who is a registered nurseryman, writes that he will try to help find South African plants for those who are interested. We are grateful to Mr. Latti for his kind offer.

Mr. & Mrs. D. V. Applegate, of Monona Plantation, Ferriday, Louisiana and Santa Cruz, Bolivia, visited us in the fall (1957). Mrs. Applegate, who is the daughter of Mrs. U. B. Evans, is keenly interested in amaryllids and started the collecting activities in Bolivia several years ago which led to the trip by Prof. Ira S. Nelson in 1954 under the sponsorship of the LOUISIANA SOCIETY FOR HORTICULTURAL RESEARCH.

Mr. G. K. Clout, 147 George St., Quirindi, New South Wales, Australia, has joined the Society. He is particularly interested in hybrid *Amaryllis* and promises to write an article for HERBERTIA in a few years about his experiences.

AMARYLLIS JUDGES CERTIFICATES

Since the last report in 1957 HERBERTIA (page 32), the following Amaryllis Judge's Certificates have been issued by the AMERICAN AMARYLLIS SOCIETY:

32. Mrs. L. J. Wathen, 5938 Mercedes, Dallas, Texas.
33. Mrs. Fred B. Chambers, 3616 Armstrong, Dallas 5, Texas.
34. Mrs. Naneene Tuffly, 715 Skillman, Dallas 14, Texas.
35. Mrs. Charles Bell, Route 7, Box 399, Hattiesburg, Miss.
36. Mrs. Wm. H. Sparrow, 311 4th Ave., Hattiesburg, Miss.
37. Mrs. Joe Patterson, 4019 Broadway St., Houston 17, Texas.

For information about taking the examination for the Amaryllis Judge's Certificate of the AMERICAN AMARYLLIS SOCIETY, write to Mr. W. D. Morton, Jr., 3114 State Street Drive, New Orleans 25, La.

NATIONAL AMARYLLIS JUDGES COUNCIL

Further progress has been made toward the founding of this organization under the leadership of Mrs. B. E. Seale of Dallas, Texas. All accredited Amaryllis judges are members of the Council. A fuller report will appear in 1959 HERBERTIA.

[MOLDENKE, GENERA & SPECIES—continued from page 60.]

lobes 6 mm. wide; style 4 cm. long.—Argentina: La Incrucijada (Encruicijada), Sierra Famatina, 2500—3000 meters altitude, collected by G. Hieronymus & G. Niederlein on January 21, and February 2, 1879.

H. angustifolium Pax, (l. c., p. 331.)—Stout, with the neck of the bulb greatly elongated; leaves coriaceous, elongate, linear, margined, glaucescent, appearing at the same time as the flowers; scape stout, tall, bearing the pseudo-umbellate about 6-flowered inflorescence; bracts forming an involucre; flowers greatly declinate, pedicellate, the pedicels longer than the spathe; tube of the perigonium short, the throat possessing a fimbriate corona, the laciniations unequal, narrowly lanceolate; filaments unequal, the longer ones barely surpassing the perigonium, the shorter ones included, all flat; style filiform, surpassing the perigonium and stamens; stigma trifid, the lobes erect; capsule trilobed, 3-sulcate; seeds flattened, black, very numerous in the cells. The neck of the bulb is to 13 cm. long; the leaves 1—1.5 cm. wide; the scape 80—100 cm. tall, almost 1 cm. in diameter at the middle and 0.5 cm. in diameter beneath the inflorescence; the pedicels 5 cm. long; the perigonium 7—8 cm. long, with the broader segments 1 cm. wide; the ovary 8 mm. long; the style 10 cm. long, with the lobes of the stigma 2 mm. long; the capsule 1.5 cm. in diameter.—Between the streamlets Lwon and Arroyo de Las Islas, between Mt. Agudo and San Pedro, Argentina.

H. petiolatum Pax, (l. c., p. 330.)—Bulb brown, globose, not elongated into a neck; leaves lanceolate, acute, narrowed into a short petiole at the base, scarcely chartaceous, appearing at the same time as the flowers; scape nearly equaling the leaves; involucral bracts 2, marcescent at time of anthesis, lanceolate; flowers scarlet, 1 or 2 per scape, pedicellate, declinate, broadly funnelform, the pedicels slender, shorter than the spathe; tube of the perigonium short, the throat guarded by small scales located between the base of the filamenta, the segments oblong, acute; filaments flat, inserted in the throat and slightly shorter than the perigonium, somewhat unequal; anthers versatile, linear; style filiform, surpassing the anthers; stigma trifid, the lobes erect, not recurved. The bulb is 3—4 cm. in diameter; the leaves to 20 cm. long, 2—2.5 cm. wide, narrowed at the base into a petiole that is 1—2 or more cm. long and 2—3 mm. wide; the scape to 20 cm. tall; the involucral bracts 3 cm. long; the pedicels 2—2.5 cm. long; the flowers 6—7 cm. long; the segments of the perigonium 1—1.5 cm. wide; the anthers 12 mm. long; the lobes of the stigma 2 mm. long.—Argentina.

Hemerocallis x *traubara* Moldenke, hybr. nov. Plantae hybridae species complures implicatae, magnitudine staturae variae, floribus magnitudine variis de tempore aestivo productis. Holotype: No. 620 (TRA). *H.* x *traubara* cl. 'Golden Triangle'.

2. SPECIOLOGY

[EVOLUTION, DESCRIPTION, CLASSIFICATION AND PHYLOGENY]

AMARYLLIS ELEGANS VAR. AMBIGUA

This plant has established a place for itself since it can be grown outdoors in California. Two forms, practically identical are illustrated in Fig. 3, which have been obtained from Ecuador and Costa Rica respectively.

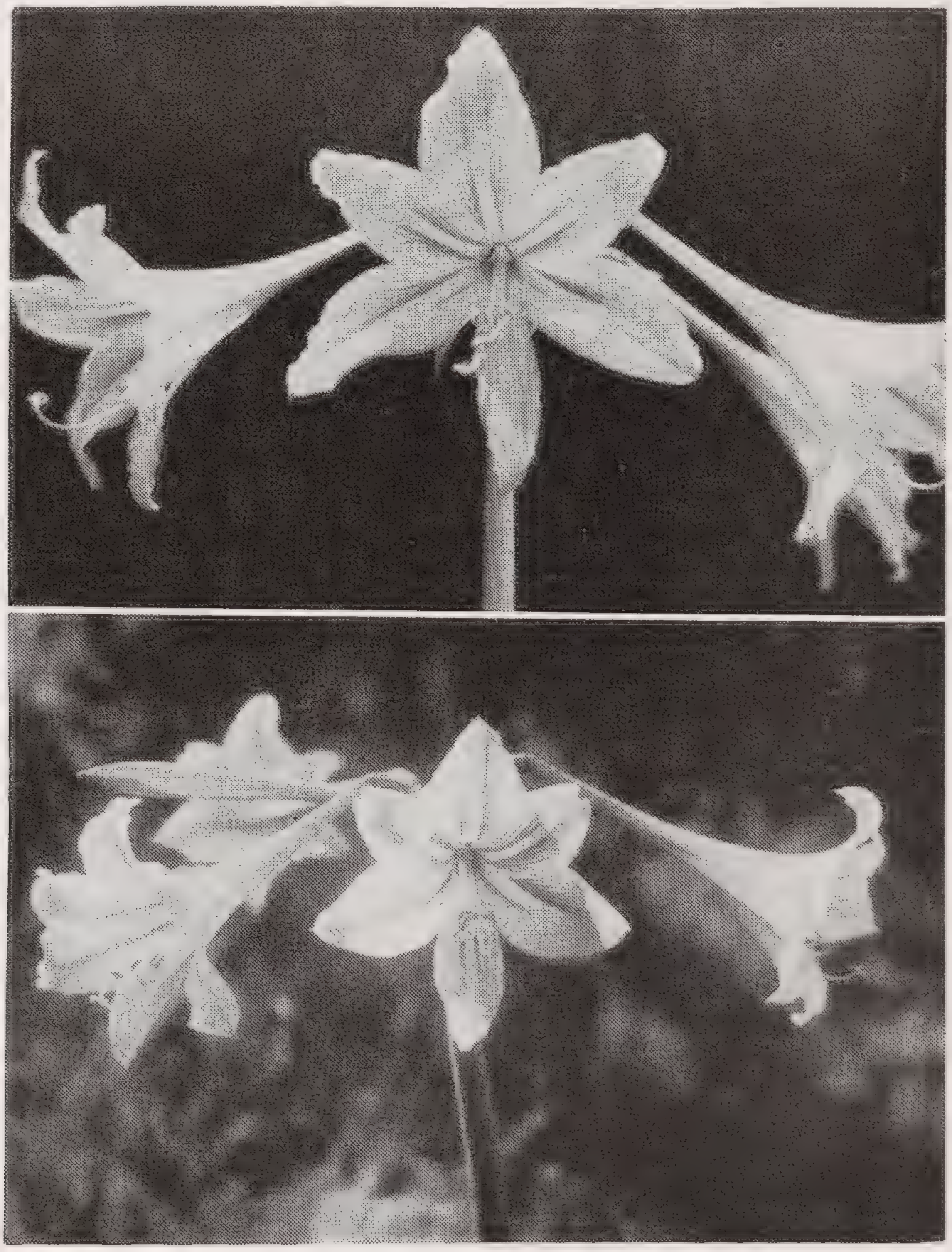

Fig. 3. *Amaryllis elegans* var. *ambigua. Upper,* from Cuenca, Eculor (cult.), photo by Ira S. Nelson; *lower,* from *Costa Rica (cult.)* Photo by L. S. Hannibal.

I. AMARYLLIS ELEGANS VAR. AMBIGUA FROM ECUADOR

Hamilton P. Traub and Ira S. Nelson

Amaryllis elegans var. *ambigua* (Herb.) Traub & Moldk., in Amaryllidac.: Tribe Amaryll. 186. 1949; Traub, in Amaryllis Manual, p. 267. 1958. Syn.—*Hippeastrum ambiguum* Herb., Bot. Mag. pl. 3542. 1837; *H. ambiguum* Herb. var. *ambiguum* (fide Int. Code, Art. 26), [syn.-*H. ambiguum* Herb. var. *longiflorum* (err. *longiflora)*

Herb.], in Bot. Mag. pl. 3542. 1837; Herb. Amaryll. 136. 1837; *Amaryllis* ambigua (Herb.) Sweet, in Hort. Brit. 3rd ed. 674. 1839; seub., in Mart. Fl. Bras. 3(1): 152. 1847.

This plant was originally introduced from Peru into England in the early 19th century where its status was variously interpreted. In the 1940's, Dr. Goodspeed brought back stock of it from South America but this is now apparently lost. Mr. Hannibal obtained it from Costa Rica as a cultivated plant about the same time. More recently Prof. Ira S. Nelson obtained it from two sources in Cuenca, Ecuador, in 1954, under cultivation, as reported in Bulletin 2, Louisiana Society for Horticultural Science, pages 24-25, 1957. It was pointed out that since it was originally described from Lima, Peru by Herbert in 1821 and was obtained from Ecuador in 1954, it appears that this plant is more widely distributed than was previously realized. The umbel is 4 to 5-flowered; the flowers are relatively long with a tepaltube 7.8 cm. long. The perigone is white, striped Tyrian rose, with the color more prominent in the upper part of the tepalsegs. The illustration Fig. 3, does not do the plant justice since it must be seen to be appreciated.

II. AMARYLLIS ELEGANS VAR. AMBIGUA FROM COSTA RICA

L. S. Hannibal, **California**

Back in 1943 the writer reported the flowering of this plant (under the misapplied name *Amaryllis conspicua)*, and a photograph was reproduced on page 152 of 1943 Herbertia (Reprinted in 1954 Herbertia, page 22). [This is again reproduced in Fig. 3 for comparison with the introduction from Ecuador—Ed.]

Experience shows that this plant rarely responds to its own pollen, but that seeds set when pollens of other species of the same genus are used. However the resulting seedlings are not hybrids—The original crosses made in 1943 flowered this year and were identical with the seed parent in all respects. This is not the first time that such a phenomenon has been reported as Arlington Worsley experienced the same with *A. striata* (syn. *rutila)*, (Gardeners' Chronicle (Lond.) p. 238, Nov. 1939).

We can recognize that the failure of *Amaryllis elegans* var. *ambigua* to accept *A.* x *johnsonii* pollen, as reported in 1943, is due probably to *A.* x *johnsonii* being a triploid. But will someone kindly explain why *A.* x *johnsonii* will set seed by selfing in warm weather, and these seedlings duplicate the parent in all ways. Several people have questioned the writer on this point. We would expect a hybrid to show some variation when selfed, even if a triploid, but here we have both *A.* x *johnsonii*, presumably a hybrid, and *Amaryllis elegans* var. *ambigua* received by the writer from Costa Rica, which has been regarded as a doubtful species, behaving strictly as species and varieties should. What is the answer?

Despite the fact that *Amaryllis elegans* var. *ambigua* and *A. elegans* are very slow to grow from seeds these bulbs are the hardiest *Amaryllis* known. They are the only bulbs which thrive out of doors in a region where three months of the year averages 40° F. *A.* x *johnsonii* can tolerate such conditions, but few Amaryllis hybrids can for more than one year. None have survived two years, but *Amaryllis elegans* var. *ambigua* and *A. elegans* thrive on such treatment. In fact a resident of British Guiana reports that *A. elegans* grows by the hundreds on the river deltas in that area and that the bulbs are totally submerged for several months during the rainy season. Knowing how sensitive most *Amaryllis* are to an excess of water this comes with some surprise, but it probably explains one of the features contributing to the extreme hardiness of species in this particular subgenus.

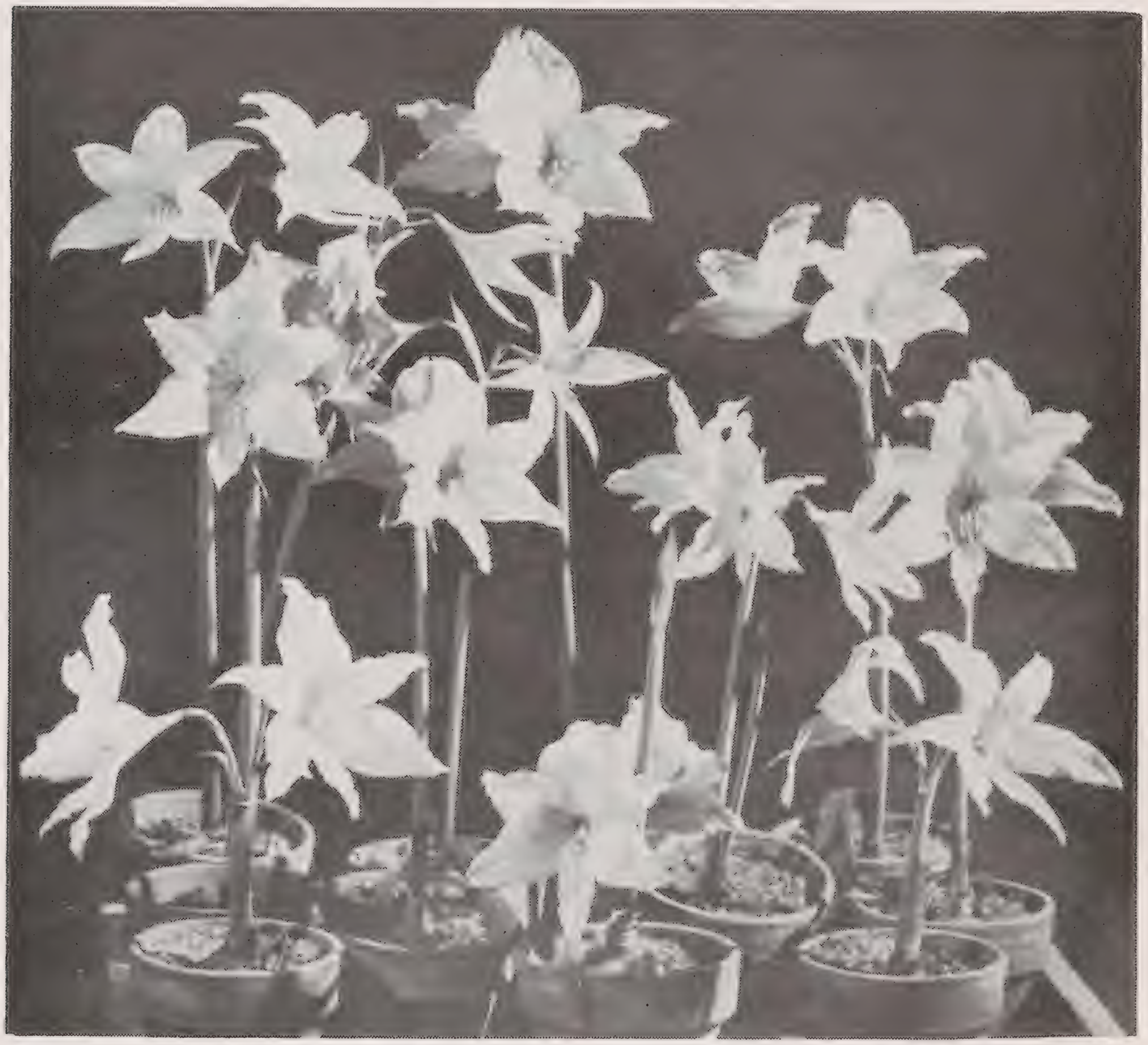

Fig. 4. A group of *Amaryllis evansiae*, showing variations in flower shape. The shorter scapes of the plants in the foreground are due to cultural conditions. Photo by Ira S. Nelson.

AMARYLLIS EVANSIAE

Hamilton P. Traub and Ira S. Nelson

Amaryllis evansiae Traub et Nelson was first described in Baileya (4: 85-88, figs. 30-31, 1956); and it was illustrated there and in Bulletin No. 1 (1956), Louisiana Society for Horticultural Research. The species was collected by Ira S. Nelson under the sponsorship of that Society in Bolivia in 1954.

Amaryllis evansiae is very interesting since it is the first known in the genus to show marked variations within the species. In all the other 47 species, variation within the species is slight, even in *Amaryllis belladonna* L. which has a very wide range from Mexico, West Indies southward to Bolivia.

Such characters as leaf shape and length, bulb size and shape, and so on, are fairly uniform in *Amaryllis evansiae.* However, as shown in Fig. 4, the flower shape varies considerably. Although the stigma is usually capitate (obscurely 3-lobed), a distinctly 3-lobed stigma (with short rounded lobes) has been observed in a few individuals. The flower color varies considerably from very pale yellow, chartreuse (very light green) and pastel shades. All of this lends support to the hypothesis that this species is of relatively recent origin and not sufficient time has elapsed to allow for a stabilization of all of the characters.

It is hoped that nurserymen will soon list *Amaryllis evansiae* for sale in their catalogs. It can be rapidly multiplied from seeds. At least three forms should be selected for propagation—forma *flavescens* (very pale yellow); forma *virescens;* and forma *pastelescens* (pastel colored).

NEW AMARYLLIS SPECIES

HAMILTON P. TRAUB

In recent years, Dr. Lyman B. Smith, the noted authority on the BROMELIACEAE, of the U. S. NATIONAL HERBARIUM, made collecting trips to South America in collaboration with Dr. P. Paulino Reitz, Dr. R. Klein and Dr. Sulfridini, of the "HERBARIO BARBOSA RODRIQUES", Itajai, Santa Catarina, Brazil. Along with other specimens several known *Amaryllis* species, such as *A. breviflora, A. cybister,* and so on, were collected, and also one new species from Santa Catarina, Brasil. Specimens collected earlier by Dr. A. Macedo in Minas Gerais, and Dr. P. Dusén, in Parana, also represent new species.

These are described below and we hope that our Brasilian friends will send us living bulbs of these before too long.

AMARYLLIS MINASGERAIS

Specimens of this species were collected in the State of Minas Gerais in 1948 by Dr. A. Macedo. It belongs in the subgenus *Amaryllis* in which the throat of the tepaltube is not closed in by the paraperigone, and the stigma is capitate (only obscurely 3-lobed). It is allied to *Amaryllis belladonna* L. and its relatives, but differs from the former in having linear-lorate narrower leaves with a hyaline margin, only 1.5—2.3 cm. wide—less than an inch, and fully developed with the flowers, in the 4-flowered umbel, in the shorter spathe and pedicels, and in other particulars as shown by the following description. The species has been named in honor of its native habitat, the State of Minas Gerais.

Amaryllis minasgerais Traub, **sp. nov.**

Bulbus pyriformis, collo brevi; foliis lineri-loratis 1.5-2.3 cm. latis, margine hyalino; spathae valvis 2 lanceolatis 5.4-6.5 cm. longis; pedicellis 5—5.5 cm. longis; umbella 5-flora; perigonio miniaceo, fauce flavida; tubo tepalorum 3 cm. longo; segments tepalorum 7.5—8 cm. longis ellipticis 2.7—3.5 cm latis. staminibus quam stylo brevioribus; stylo quam segmentis tepalorum 1/5 brevioribus; stigmate capitato.

DESCRIPTION.—*Bulb* pear-shaped, 4.1 cm. long, 4 cm. in diam. below the middle, 2.3 cm. in diam. at the apex, neck 2 cm. long, 2 cm. in diam. *Leaves* produced with the flowers, linear-lorate, (cut to about 20 cm. on the type sheet, but apparently much longer), 1.5—2.3 cm. wide, (glaucous?), with hyaline margin. *Scape* 36 cm. tall. *Spathe-valves* 2, lanceolate, up to 5.5 cm. long, apex acutish or bluntish-roundish. *Pedicels* up to 5.5 cm. long. *Umbel* 4-flowered; flowers produced in the spring. *Ovary* 1.2 cm. long, 6 mm. diam. *Perigone* 10.5—11 cm. long, "vermilion, yellowish in the throat," according to the collector. *Paraperigone* consisting of a few short bristles. *Tepaltube* 3 cm. long. *Tepalsegs* 7.5—8 cm. long, elliptic, 2.7—3.5 cm. wide. *Stamens* shorter than the style; *style* 1/5 shorter than the tepalsegs; *stigma* capitate.

Holotype: No. 2-196-538 (US), A. Macedo (#1278), 10-15-48, Brasil, Santa Terezinha, Municipio Ituiutaba, State of Minas Gerais.

AMARYLLIS PARANAENSIS

In 1915, Dr. P. Dusén collected a specimen of an *Amaryllis* species in Parana which was erroneously referred to what is now known as *Phycella bicolor,* native to Chile, which has bright red flowers passing into yellowish-green towards the base. Dr. Dusén thus implies that the flowers of his collection in Parana has similar colored flowers, but this has to be checked against fresh flowers. Living bulbs from the type locality are therefore wanted in order to complete this detail of the description. The presence or absence of a paraperigone could not be determined from the dried specimen, and this detail also needs to be checked.

This new species has been named for its habitat in the State of Parana, *Amaryllis paranaensis.* It belongs in the subgenus *Amaryllis* in which the apex of the tepaltube is not closed in at the throat by the paraperigone, and the stigma is capitate. It is closest to *Amaryllis miniata* Rúiz et Pavon but differs in flowering in summer, in producing the leaves after the flowers, in having flowers more or less upright, not wide open, apparently red and yellowish-green, longer stamens reaching 1/3 below the style, and in other details as is shown by the following description.

Amaryllis paranaensis Traub, **sp. nov.**

Bulbi collum non valde productum; umbella 4-flora; scapo usque ad 39 cm. alto; spathe valvis 2 lanceolatis 2.2 cm. longis; pedicellis 2.5—3 cm. longis; perigonio plusminusve arrecto 7—8.5 cm. longo; tepalorum tubo 5 mm. longo; tepalorum segmentis oblanceolatis usque ad 6.5—8 cm. longis; staminibus longioribus quam segmentis tepalorum 1/3 brevioribus; stylo segmentis tepalorum paulo breviore vel subaequante; stigmate capitato.

DESCRIPTION.—*Bulb* up to 10 cm. long, about 6.5 cm. in diam. *Leaves* unknown, apparently produced after the flowers. *Scape* up to 39 cm. tall. *Spathe-valves* 2, up to 7 cm. long, 2.2 cm. wide below the middle, bracteoles very much smaller. *Umbel* 4-flowered. *Flowers* more or less upright, not wide open. *Pedicels* 2.5-3 cm. long. *Ovary* 8 mm. long, 5 mm. in diam. *Perigone* upright, 7—8.5 cm.

long. *Tepaltube* 5 mm. long. *Tepalsegs* oblanceolate, up to 6.5—8 cm. long, up to 1.8—2 cm. wide above the middle, apex acute. Longest *stamens* about 1/3 shorter than the tepalsegs. *Style* slightly shorter than, or subequaling the tepalsegs. *Stigma* capitate.

Holotype: US 1,481,899 (P. Dusén No. 16,749), Brasil: Parana, "Jaguariahyva, in campo prope marg. silvula," 2-26-15.

AMARYLLIS SANTACATARINA

Specimens of this new species were collected in 1956 by Dr. Lyman B. Smith and Dr. P. Paulino Reitz in the State of Santa Catarina. It belongs in the subgenus Lais, in which the tepaltube is not closed in at the throat by the perigone and the stigma is distinctly trifid. It is nearest to *Amaryllis flammigera* (Holmb.) T & U, from Misiones, Santa Ana, Argentina, with blood-red spathe-valves, and flowers bright red with purple veins. The new species differs from *A. flammigera* in having a longer bulb-neck, longer leaves, longer scape, no blood-red on the spathe, the umbel 6-flowered, longer pedicels, flowers scarlet with faint whitish star in throat, stamens shorter than the style. It differs also in other particulars as indicated in the following description. The presence or absence of the paraperigone could not be observed in the holotype, and this detail has to be checked when living material is received from Dr. Reitz. The species has been named in honor of the State of Santa Catarina.

Amaryllis santacatarina Traub, **sp. nov.**

Bulbi collum ca. 10 cm. longum; foliis sub anthesin non prorsus expositis, usque ad 41 cm. longis lorato-lanceolatis; scapo 54 cm. alto; spathae valvis 2 lanceolatis 5.7 cm. longis; umbella 6-flora; petiolis 2.5—4.5 cm. longis; florum majorum perigonio usque ad 7.3 cm. longo coccineo, fauce stella albida indistincta ornata; tubo tepalorum 7 mm. longo; florum majorum segmentis tepalorum usque ad 6.6 cm. longis; staminibus quam stylo brevioribus; stylo quam segmentis tepalorum breviore; stigmate trifido, lobis 2 mm. longis paulo recurvatis.

DESCRIPTION.—Lower part of *bulb* unknown. *Bulb-neck* about 10 cm. long. Leaves not fully developed at flowering time, up to 41 cm. long, lorate-lanceolate, up to 2 cm. wide in the dry condition, narrow acute-roundish. *Scape* 54 cm. tall above the bulb neck, narrowing gradually to the apex. *Spathe-valves* 2, lanceolate, 5.7 cm. long. *Umbel* 6-flowered, one flower smallish. *Pedicals* 2.5—4.5 cm. long. *Ovary* 11 mm. long, 4 mm. in diam. Flowers held horizontally to perhaps very slightly declined. *Perigone* of larger flowers up to 7.3 cm. long, scarlet, with faint whitish star in throat. *Tepaltube* 7 mm. long. *Tepalsegs* of larger flowers up to 6.6 cm. long, up to 1.8 cm. wide. *Stamens* shorter than the *style* which is shorter than the tepalsegs. *Stigma* trifid, lobes 2 mm. long, slightly recurved.

HOLOTYPE: L. B. Smith & Pe. R. Reitz No. 9101 (TRA), Santa Catarina, Brasil, Mun. Cacador; west of Cacador Taquara Verde (25 km), alt. 900-1000 m., burned over bog, Dec. 23, 1956.

CYTOLOGICAL INVESTIGATIONS IN **LYCORIS.**
2. CYTOLOGICAL SIMILARITIES BETWEEN **LYCORIS AUREA** AND **L. TRAUBII.**

SMRITIMOY BOSE, *The Blandy Experimental Farm, University of Virginia*

INTRODUCTION

Chromosome number and morphology in *L. aurea* have been studied by Inariyama as early as 1931. In his subsequent papers (1932; 1937 and 1953) he reported the existence of three different chromosome types in roottip and pollen mother cells of this species. Somatic numbers of 12, 13 and 14 were encountered. Bulbs of *L. aurea* having 2n numbers of 12 and 13 were found growing in Japan, while the type with 2n of 14 was collected only from Formosa. Plants having somatic chromosomes of 12 and 13 could not be distinguished from one another externally by their morphological characters. However the 14 chromosome type had larger bulbs and leaves compared with the former two types. So far as the chromosome morphology is concerned, there was a decrease in the number of V shaped chromosome with the increase in chromosome number. Plants having 12 chromosomes had 10 V's and 2 rods, while in 13 and 14 types 9 V's plus 4 rods and 8 V's with 6 rods were found respectively. This situation was also confirmed from meiotic studies.

Recently, Hayward (1957) described a new taxon, named *L. traubii,* which is very similar to *L. aurea* in its external morophology. Purpose of the present study was to make a cytological comparison of the chromosome number and morphology of the two morphologically similar types. Bulbs were generously furnished by Mr. Hayward and Dr. H. P. Traub.

MATERIALS AND METHODS

Table 1 lists the plant materials used in this investigation, together with their source and accession numbers.

Table 1

L. aurea and **L. traubii,** source and accession numbers.

Taxa	Source	Accession number
aurea	W. Hayward Orlando, Florida.	13103-55
traubii	W. Hayward Orlando, Florida.	13660-57
traubii	H. P. Traub La Jolla, California.	14068-57

Roottips were placed in a .2 per cent aqueous solution of colchicine prior to fixation. The rest of the procedure was the same as follows in the previous study (Bose, 1957). Prefixation in .2 per cent colchicine solution for 4 hours gave the best results.

A detailed analysis of the karyotypes was made and idiograms were drawn for the taxa studied here. A system has been arranged which will standardize terminology for all types of chromosomes encountered in *Lycoris;* to have this most logical it has been necessary to give some different designations than those assigned for similar chromosomes in the previous paper (Bose, 1957).

Drawings were made with a camera lucida using a 1.25 N. A. apochromatic objective (x90) with a compensating eye piece (x15) giving a magnification at table level of x2500 approximately.

OBSERVATIONS

On the basis of the present study the chromosome complement can be classified into the following types:—Type A.—Chromosomes with median primary constrictions. Type B:—Chromosomes with submedian primary constrictions. Type D:—Chromosomes with nearly terminal primary constrictions and a dot like shorter arm. Type D1:—Same as type D but shorter in size.

The number of Chromosomes of each type occurring in the three taxa are listed in Table 2.

Table 2

Chromosome types in **L. aurea** and **L. traubii.**

Types	**L. aurea** 2n=12	**L. traubii** 2n=12	**L. traubii** 2n=13
A	6	6	5
B	4	4	4
D	2	2	2
D1			2

Karyotypes can be tabulated as follows:—*L. aurea* : 2n=12; 6 chromosomes of type A; 4 chromosomes of type B and 2 chromosomes of type D. *L. traubii* : 2n=12; 6 chromosomes of type A; 4 chromosomes of type B and 2 chromosomes of type D. *L. traubii* : 2n=13; 5 chromosomes of type A; 4 chromosomes of type B; 2 chromosomes of type D and 2 chromosomes of type D1.

Details of chromosome measurements and arm ratios are arranged in Table 3.

Table 3

L. aurea and **L. traubii** chromosomes: (1) average length in microns, and (2) chromosome arm ratios at mitotic metaphase following pretreatment with .2 per cent colchicine.

Chromosome type	**L. aurea (2n=12)**		**L. traubii (2n=12)**		**L. traubii (2n=13)**	
	Length	Ratio **short arm** / total lg.	Length	Ratio **short arm** / total lg.	Length	Ratio **short arm** / total lg.
A	23.2	.50	24.8	.50	24.8	.50
B	21.6	.47	22.8	.47	23.6	.46
D	11.8	.01	12.6	.01	12.6	.01
D1					10.2	.01

DISCUSSIONS

A comparison of the chromosome number and morphology of the 12 chromosome type *L. traubii* showed striking similarities with the 12 chromosome type of *L. aurea.* Even the length and chromosome arm ratios of V shaped chromosomes of the two were almost similar. The same is also true for the rod-shaped chromosomes. It may be concluded from this that the 12 chromosome type of *L. traubii* imported from Japan to this country, is cytologically indistinguishable from the 12 chromosome type of *L. aurea,* also a native of Japan, so far as their somatic chromosome number and morphology is concerned. Hayward (1957) has separated these two taxa on the basis of leaf, flowering scape and flower character differences. The gross morphological differences by which these taxa are distinguished (Hayward, 1957) are apparently the result of genic changes. Traub (private communication) reports that hybrids between *Lycoris aurea* (seed parent) x *L. traubii* have been obtained, the seedlings show glaborous leaves dominant as in *L. traubii.*

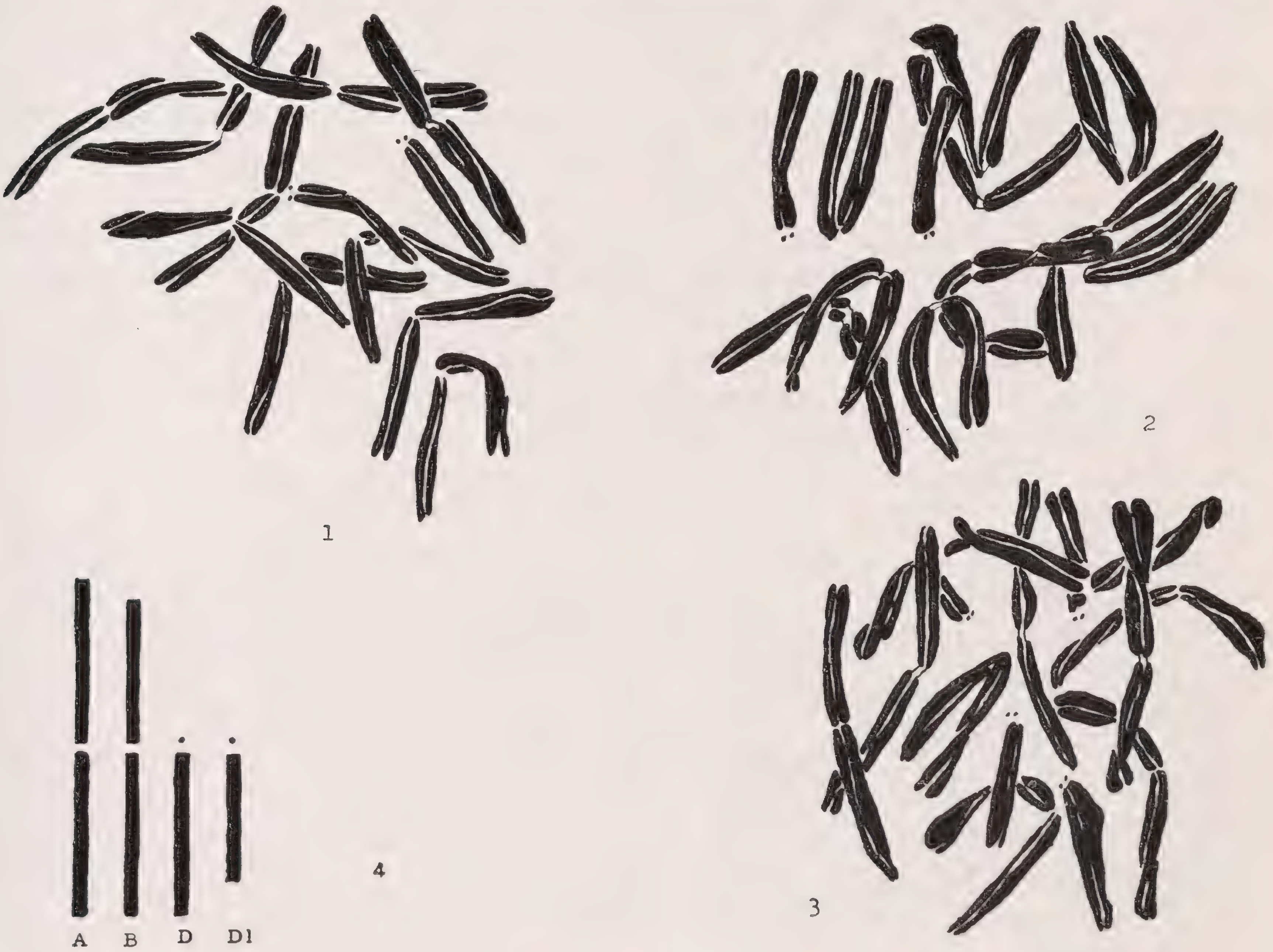

Fig. 5. Chromosomes of *Lycoris aurea* and *L. traubii.* Somatic metaphase polar views drawn at X2500, reduced to approximately X1150: 1. *Lycoris aurea,* 2n = 12. 5-2. *L. traubii,* 2n = 12. 3. *L. traubii,* 2n = 13. 4. Idiograms of each chromosome type found here: A (median centromere), B (submedian centromere), D (nearly terminal centromere), D1 (as D, but shorter).

Another clone of *L. traubii* studied here, had 13 somatic chromosomes. A similar number has also been reported in *L. aurea* by Inariyama (1932), who found 9 V's and 4 rods in this type. The 13 chromosome clone of *L. traubii* also has 9 V's and 4 rods. Since no bulbs of the *L. aurea* clone with 13 chromosomes were available a karyotype comparison could not be made in this case.

In *Lycoris,* out of fifteen species recognized so far (Traub, 1957), chromosome numbers have been determined for ten species. Number and structural similarities have been noted with respect to the chromosomes of several species. For instance, *L. sprengeri, L. sanguinea, L. haywardii* and a variety of *L. radiata* all have 22 rod-shaped chromosomes, while both *L. squamigera* and *L. caldwellii* show 6 V's and 21 rod-shaped chromosomes. A critical cytotaxonomical comparison of these groups is highly desirable. A knowledge of meiotic chromosome behaviour and of the crossing abilities of species with the same chromosome numbers could aid in explaining their status and interrelationships.

The origin of V and rod-shaped chromosomes in three new species of *Lycoris* were discussed by the present author in a previous paper (Bose, 1957). The role of the centromere in the origin of chromosomes was emphasized at that time. Recent theories of Lima-de-Faria (1956), regarding the centromere structure and its possible role in chromosome organization has considerable suggested importance in explaining the origin and survival of telocentric chromosomes (Marks, 1957). In *Lycoris,* attempts should be made to get a clear picture of the centromere region of the V and rod-shaped chromosomes and also of the chromosomes with nearly terminal centromeres. In ordinary preparations of roottip chromosomes these regions appear as unstained gaps. Suitable stages of the chromosome cycle and use of the right prefixative and staining chemicals are of utmost importance in this connection. Attention has already been given by the present author to this end.

Variation in shape and bimodality of the chromosome in *Lycoris* and other plants has been explained by Darlington (1956) to be caused by the misdivision of the centromere and by the origin of so-called isochromosomes. We can, at present, take these to be important factors in the origin of *Lycoris* species, with differing chromosome morphology, under natural conditions. A project has been initiated which will attempt to secure experimental evidence bearing on these points. Bulbs of three different species of *Lycoris* have already been subjected to gamma rays from a Cobalt-60 source. A detailed study of resulting chromosome breaks, and reunions, with special attention to V and rod-shaped chromosomes and their centromere regions should shed light on this problem.

SUMMARY

In *Lycoris traubii* clones with 12 and 13 somatic chromosome types have been found. The type with 12 chromosomes is identical with the 12 chromosome type of *L. aurea* with respect to somatic chromosome number and morphology.

ACKNOWLEDGEMENTS

The author wishes to express his indebtedness to Dr. W. S. Flory, Jr., for his guidance and criticism during the course of this investigation.

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CYTOLOGICAL INVESTIGATIONS IN **LYCORIS.**

3. CHROMOSOME NUMBER AND KARYOTYPE ANALYSIS IN **LYCORIS INCARNATA.**

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INTRODUCTION

Lycoris is a very interesting genus from both the cytological and the taxonomic standpoints. With the four new species recently described by Traub (1957) and Hayward (1957), the total number of *Lycoris* species presently listed is fifteen. Ten of these have been the subject of previous cytological studies (Inariyama, 1931, 1932, 1937, 1953; Sato, 1938; Mookerjea, 1955 and Bose, 1957). This present report, coupled with one prepared concurrently on *L. traubii* (Bose, 1958a), brings to twelve the number of species of this genus for which chromosome records are available. Table 4 records the chromosome numbers and morphological data reported by different authors.

There are uncertainties as to the origin and as to the interrelationships of the several species. The chromosome complements of these, with their differences in both number and morphology offer one good source of evidence. For this reason data from previous works have been assembled and chromosome number determinations and karyotype analyses are being made for all the available species of *Lycoris*. This study should also have a bearing on points of taxonomic uncertainty.

Lycoris incarnata has not been the subject of previous cytological studies. The present paper reports the results of a study of the somatic chromosomes of this taxon. Bulbs of this species were generously furnished by Mr. W. Hayward.

Cytological methods employed were the same as followed in previous work of this series (Bose, 1958a).

Table 1 lists the plant materials used in this investigation, together with their source and accession numbers.

Table 1.

Lycoris incarnata and **Lycoris** sp. source and accession number.

Incarnata	Orlands, Florida.	Accession
Taxa	Source	Accession number
incarnata	W. Hayward Orlando, Florida	13106-55 12041-50
L. sp.	W. Hayward Orlando, Florida	

OBSERVATIONS

The following types of chromosomes are found in the complement of *L. incarnata*. Type A:—Chromosomes with median primary constrictions. Type B:—Chromosomes with submedian primary constrictions. Type C:—Chromosomes with subterminal primary constrictions. Type C1:—Same as type B but shorter in size. Type D:—Chromosomes with nearly terminal centromere and a dot like shorter arm. Type D1:—Same as type D but shorter in size. B-chromosome:—A very short chromosome with nearly subterminal primary constriction. (Fig. 6).

The number of chromosomes of each type occurring in *L. incarnata* are listed in Table 2.

Table 2.

Chromosome types in **L. incarnata.**

Types	**L. incarnata**
A	2
B	2
*C	17
*C1	4
D	2
D1	2
B-chromosome	1

---

* Same as types B and B1 respectively, used in the previous study (Bose, 1957).

Karyotypes can be tabulated as follows:—*Lycoris incarnata:* 2n=29 plus 1 B-chromosome; 2 chromosomes of type A; 2 chromosomes of type B; 17 chromosomes of type C; 4 chromosomes of type C1; 2 chromosomes of type D; 2 chromosomes of type D1 plus one B-chromosome.

Details of chromosome measurements and arm ratios are arranged in Table 3.

Table 3.

Lycoris incarnata chromosomes: (1) average length in microns and (2) chromosome arm ratios at mitotic metaphase following pretreatment with .2 per cent colchicine.

Chromosome type	**L. incarnata**	
	Length	Ratio **Short arm** total lg.
A	23.12	.50
B	20.8	.44
C	10.8	.14
C1	8.8	.18
D	11.8	.01
D1	8.6	.02
B-chromosome	2.6	.28

In 1950, sometime before our other material of *Lycoris incarnata* was received, a single bulb labelled as *L. incarnata* was secured. This bulb has never flowered. A count of its somatic chromosomes shows this *Lycoris* sp. to have a 2n number of 18, with the chromosome morphology quite different from other species of *Lycoris* studied. It seems doubtful if this is a separate clone of *L. incarnata* and for the present this is merely being listed as *Lycoris* sp.

The chromosomes for *L. incarnata* and *Lycoris* sp. may be found in Fig. 6.

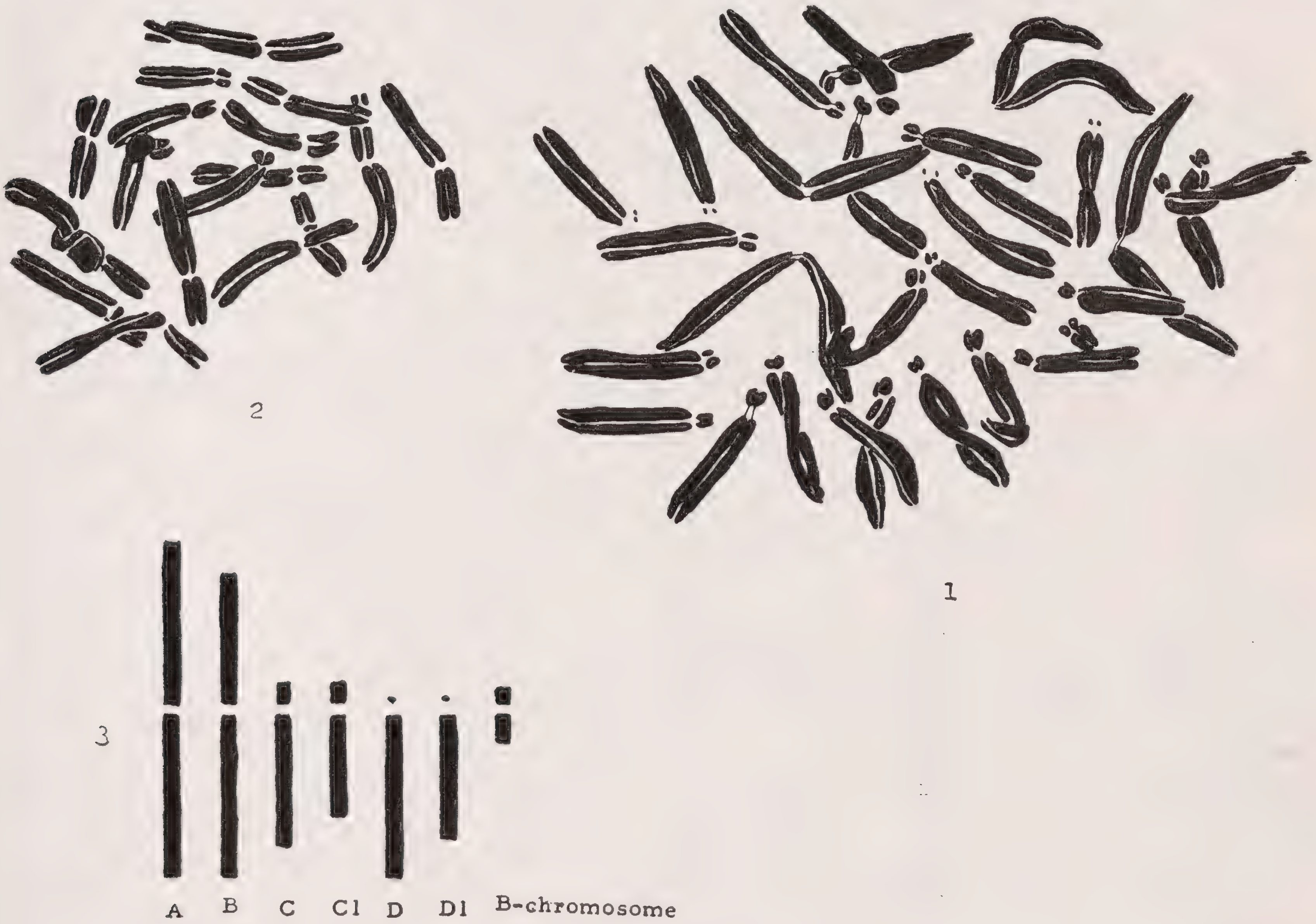

Fig. 6. Chromosomes of *Lycoris incarnata* and unidentified *L.* sp. Somatic metaphase polar views drawn at X2500, reduced to approximately X1150: 1. *Lycoris incarnata,* 2n = 29 plus 1B. 2. *Lycoris sp.* unidentified, 2n = 18. 3. Idiogram of each of the chromosome types in *L. incarnata,* A, B, C, C1, D, D1 and B-chromosome.

DISCUSSION

The karyotype analysis shows that the chromosomes can be broadly divided into V and rod-shaped elements, similar to those found in previously studied species of *Lycoris*. In *L. incarnata* however the V chromosomes can be distinguished quite readily as medianly or submedianly constricted ones. One very interesting chromosome type was found here. This is a very small chromosome compared with all other types. This type of chromosome has been called various names, e.g. B-chromosome, supernumerary chromosome, accessory chromosome etc., by different workers (Randolph, 1928; 1941, Muntzing, 1945; 1949;

1954 and Ostergren, 1947). In *Amaryllidaceae,* they have been observed in *Cooperia, Narcissus, Haemanthus,* and *Crinum* (Darlington and Wylie, 1955). This is the first time, so far as known, that a B-chromosome has been reported in any species of *Lycoris.* A glance at Table 4 will show that this type of chromosome is quite unusual in *Lycoris.* The usual karyotype consists of V and rod-shaped elements.

Nothing definite can be said now regarding the origin of the B-chromosome observed here. Darlington's (1956; Table I) recent review of the origin of B-chromosomes in different plants suggests that these are generally derived from A or normal chromosomes. Irregular meiosis in plants with rings and fragmentation is believed to play a part in their origin. More recently Swanson (1957) has discussed the studies on supernumerary or B-chromosomes by various workers. The cytological characteristics and behavior of the B-chromosome in *L. incarnata* will be studied through the entire cell cycle with particular reference to its origin, behaviour and heterochromatic or euchromatic nature.

Table 4

Chromosome number and morphology reported in **Lycoris** species.

species	2n	Chromosome morphology	Author
albiflora	17	5V 12R	Inariyama, 1953.
aurea	12	10V 2R	Inariyama, 1953, Bose, 1958a.
	13	9V 4R	Inariyama, 1953.
	14	8V 6R	Inariyama, 1953.
caldwellii	27	6V 21R	Bose, 1957.
haywardii	22	22R	Bose, 1957.
houdyshelii	30	3V 27R	Bose, 1957.
incarnata	29 1B	4V 25R 1B	Bose, 1958b.
radiata var. pumila	22	22R	Inariyama, 1953.
radiata	33	33R	Inariyama, 1953, Mookerjea, 1955,
sanguinea	22	22R	Inariyama, 1953.
sprengeri	22	22R	Inariyama, 1953.
squamigera	27	6V 21R	Inariyama, 1953, Sato, 1938.
straminea	16	6V 10R	Inariyama, 1953.
traubii	12	10V 2R	Bose, 1958a.
	13	9V 4R	Bose, 1958a.
species	18		Bose, 1958b.

The problem of origin of different chromosome numbers with different chromosome morphology in *Lycoris* has already been discussed by the present author (Bose, 1957; 1958a), to some extent. A glance at Table 4 shows that in *Lycoris,* species with different chromosome numbers are found. In some species they are very likely the results of chromosome doubling and polyploidy (probably both euploidy and aneuploidy being involved). In others hybridization may have played a part. Somatic numbers such as 13, 14, 16, 17, 27 and 29 plus 1 B-chromosome could evolve through hybridization or in some cases simply through alteration of chromosome morphology. As regards the chromosome morphology of different species such phenomena as polyploidy, translocations and hybridization can be taken into account. In taxa with 22 and 33 rod-shaped chromosomes, as in *L. radiata,* we see the result of adding a full haploid complement to a diploid set. On the other hand species whose chromosome complements are composed of

5 V's and 12 rods, 6 V's and 10 rods or 6 V's and 21 rods, may be assumed to have originated through hybridization between different species of *Lycoris* (Inariyama, 1937; 1953). Species with 4 V's and 25 rods plus 1 B-chromosome or 3 V's and 27 rods may also be assumed to have originated through hybridization and structural alteration of chromosomes.

SUMMARY

Chromosome number in *Lycoris incarnata* is found to be 2n=29 plus 1 B. The B-chromosome is reported for the first time in any species of *Lycoris*.

ACKNOWLEDGEMENTS

The author wishes to express his indebtedness to Dr. W. S. Flory, Jr. for his guidance and criticism during the course of this investigation.

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TWO NEW LYCORIS SPECIES

Hamilton P. Traub

In 1957 Herbertia, the First Lycoris Edition, an attempt was made to present as much information as possible about these beautiful plants in order to stimulate an interest in their wider culture in the United States. The key presented in the 1957 issue showed that 15 Lycoris species had been described, and in the same issue Mr. Caldwell illustrated another unnamed species under culture. This species and still another new species are named and described in the present paper.

KEY TO REVISED SUBGENUS 2. LYCORIS

Subgenus 1. Symmanthus is not affected by the new additions and thus it will be necessary to present only a revised key to Subgenus 2. Lycoris which is given in Table 1. This shows important differences between the two new species—*Lycoris elsiae* and *L. chinensis*—and the species previously described.

TABLE 1. KEY TO SUBGENUS 2. LYCORIS OF GENUS LYCORIS

1b. Perigone distinctly irregular; leaves with lighter stripe or band in center (except in *L. caldwellii;* see 11b, below):

SUBGENUS 2. **LYCORIS**

- 8a. Flowers not chrome yellow, saffron yellow or cadmium orange color; widest leaves up to 1.5 cm. wide:
  - 9a. Flowers red or clear pink; tepaltube up to 5 mm. long:
    - 10a. Flowers red; leaves 6—9 mm. wide; tepaltube up to 5 mm. long, 2n=22 (China & Japan) .... 8. *radiata*
    - 10b. Flowers clear pink; leaves much wider (China) .... 9. *rosea*
  - 9b. Flowers not red or clear pink; tepaltube 4—23 mm. long:
    - 11a. Stamens and style much exserted from perigone; tepaltube 4—17.5 mm. long:
      - 12a. Tepaltube 4—6 mm. long; leaves medium green: Tepalsegs 3.5—4.1 cm. long, 5.2—12 mm. wide; flowers straw-colored, sometimes flecked reddish; chromosomes 2n=16 (China) .... 10. *straminea*
      - 12b. Tepaltube 8.5—13 mm. long; leaves medium or dark green:
        - 13a. Umbel tightly packed; leaves medium green; tepalsegs quite variable in size and shape, 3.3—4.4 cm. long, 6—12 mm. wide; flowers creamy colored with pinkish band in center; chromosomes 2n=17 (Japan) .... 11. *albiflora*
        - 13b. Umbel loosely arranged; leaves medium or dark green; tepalsegs 4—5.1 cm. long, 7—13 mm. wide; flowers cream-white, slightly deeper colored in center, to salmony pastel:
          - 14a. Flowers cream-white, slightly deeper colored in center; tepaltube 8.5 mm. long; chromosomes 2n=30 (China) .... 12. *houdyshelii*
          - 14b. Flowers salmony pastel; tepaltube 12—13 mm. long (Japan) .... 13. *elsiae*
    - 11b. Stamens shorter than, and style subequaling, the perigone; leaves produced in February, without whitish stripe in center and dark green; tepaltube 20—23 mm. long; flowers peach colored in bud, opening to pale yellow,

changing to creamy-white with age; tepalsegs 7.2 cm. long, 2n=27 (China) .... 14. *caldwellii*
8b. Flowers chrome yellow, saffron yellow or cadmium orange:
  15a. Flowers chrome yellow; leaves produced in early spring: Leaves glabrous; tepaltube 17.5 mm. long (China) .... 15. *chinensis*
  15b. Flowers saffron yellow or cadium orange; leaves produced in fall and winter; tepaltube 12—19 mm. long:
    16a. Leaves glabrous; flowers saffron yellow; spathe-valves ovate; tepaltube 19 mm. long; tepalsegs narrowly-oblanceolate, 12—15 mm. wide; chromosomes 2=12 (China) .... 16. *traubii*
    16b. Leaves glaucous; flowers cadmium orange; spathe-valves lanceolate; tepaltube 12 mm. long; tepalsegs narrowly-elliptic, 10—11 mm. wide; chromosomes 2n=12 (China, Upper Burma) .... 17. *aurea*

LYCORIS ELSIAE, SP. NOV.

The reader should turn to Fig. 18 of 1957 HERBERTIA for the illustration of this new species. Through the kindness of Mr. Sam Caldwell, who grew the plants, and Dr. Elsie Quarterman, Director of the Herbarium of Vanderbilt University, Nashville, Tenn., who preserved the specimens, it has been possible to describe the new species—*Lycoris elsiae*—which was named in honor of Dr. Quarterman who has assisted in preserving these and other specimens of *Lycoris* cultivated in the United States.

The closest relative is *L. houdyshelii*. *L. elsiae* blooms in late Aug.—early Sept., has a tepaltube 12—13 mm. long and salmony pastel flowers whereas *L. houdyshelii* blooms in late July-early Aug., has a tepaltube 8.5 mm. long, and cream-white flowers. There are still other differences as shown by the descriptions of these two species. Since they differ on the specific level in important characters and are reproductively separated by having different blooming dates, *L. elsiae* has to be recognized as a distinct species.

Lycoris elsiae Traub, **sp. nov.**

Foliis atroviridibus glaucis, subtus pallido-viridibus linearibus 1.2—1.3 cm. latis, ad basin usque ad 8—9 mm. angustatis, ad apicem rotundatis; floribus tarde Augusto usque at Septembro productis; umbella 6- vel 7-flora; perigonio subsalmonicolore, segmentis tepalorum oblanceolatis usque ad 7 mm. latis intensiore mediopictis; tubotepalorum 1.2—1.3 cm. longo; staminibus styloque e perigonio exsertis.

DESCRIPTION.—Bulbs and leaves somewhat larger than in *L. radiata*. *Leaves* linear, dark green with bluish cast, under side lighter green, 32 to 36.5 cm. long, 1.2 to 1.3 cm. wide, narrowing to 8—9 mm. wide at the base, apex roundish. *Scape* produced in late August to early September, 45 cm. tall. *Spathe-valves* 2, lanceolate, up to 3 cm. long. *Umbel* 6—7-flowered. *Pedicels* 7—9 mm. long. *Perigone* larger than most of *L. radiata* blooms, soft salmony in color, "with the deepest pinkish shading in a band along the center of each tepalseg; cream and yellow tints blend with the pink, and the perigone finally fades to a flesh color with ageing." *Ovary* up to 7 mm. long, 5 mm. in diam. *Tepaltube* 1.2 to 1.3 cm. long. *Tepalsegs* oblanceolate, 4 cm. long, up to 7 mm. wide. *Stamens* exserted from the perigone. *Style* longer than the stamens. *Stigma* minute.

Holotype: No. 593 (TRA), Caldwell, Aug. 31, 1957, Nashville, Tenn. (Cult.): No. 594 (TRA), isotype.

NOTES.—This species is somewhat tender even in Tennessee and should be adapted to the lower South.

LYCORIS CHINENSIS, SP. NOV.

In 1957 HERBERTIA, under *Lycoris traubii* (see top page 42), Mr. Hayward included the plant grown at the U. S. Plant Introduction Garden (P. I. 162-443) which originally came from the Sun Yat Sen Memorial Garden, Nanking, China, in 1948. It has been recently illustrated on page 370, Nat. Hort. Mag. 1957. Through the kindness of Dr. J. L. Creech, of the U. S. Plant Introduction Garden, Glenn Dale, Maryland, bulbs of this plant were obtained in the early summer of 1957, and these bloomed in the latter part of July. These showed that this plant is distinct from *L. traubii* and *L. aurea,* and it has been named for its habitat—*Lycoris chinensis.*

L. chinensis produces its glabrous foliage in early spring, blooms in July, has a tepaltube 17.5 mm. long, short ovate spathe-valves, tepalsegs narrow and all assurgent. Both *L. aurea* and *L. traubii* produce their foliage in fall and winter, and bloom in Sept.-Oct., and thus *L. Chinensis* is reproductively isolated from the former and entitled to rank as a distinct species. There are still other important character differences as shown by the descriptions and the key.

It is important to note that *L. chinensis* is the first yellow-flowered lycoris described that is hardy as far north as Maryland. Only future tests will disclose the full northern range of this species.

Lycoris chinensis Traub, **sp. nov.**

Foliis verno productis; floribus tarde Julio usque ad Augusto productis; umbella 4- vel 5-flora; perigonio flavo ("chrome yellow 605/2 RHS"); segmentis tepalorum assurgentibus; staminibus styloque declinato-adscendentibus multo exserts; paraperigonio flavo, margine brevissimo dentibis 6 minutis munito; segmentis tepalorum oblanceolatis 5.8 cm. longis, 5.8—11 mm. supra mediam latis, superne valde reflexis, marginibus corrugatis.

DESCRIPTION.—*Bulbs* globose, with short neck. *Leaves* glabrous produced in early spring. *Scape* produced in late July-August, 21 cm. tall, somewhat flattened. 7 x 8.5 mm diam. at the base, 4 x 5 mm diam. at the apex, light green. *Spathe-valves* 2, ovate, 2—2.5 cm. long, apex blunt; bracteoles very much smaller, up to 7 mm. long. *Umbel* 4—5-flowered. *Pedicels* 1.1—2.4 cm. long. *Ovary* 4.5 mm long, 4.5 mm. diam. *Perigone* chrome yellow (605/2 RHS). *Tepalsegs* assurgent, *stamens* and *style* declinate-ascending, extremely exserted. *Tepaltube* 1.75 cm. long, 3 mm diam. at the base, 8 mm diam. at the apex. *Paraperigone* yellow, a very short rim with six minute teeth. *Tepalsegs* oblanceolate, ruffled on the margins and reflexed markedly in the upper part. *Setsegs* 5.8 cm. long, 8 mm. wide above the middle, apex acute. *Petsegs* 5.8 cm. long, 11 mm wide above the middle, apex roundish. *Style* overtopping the stamens, stigma minute.

HOLOTYPE: No. 585 (TRA), 7-25-57, La Jolla, Calif. (cult.), grown from a bulb (P. I. 162443) kindly furnished by Dr. J. L. Creech, of the U. S. Plant Introduction Garden, Glenn Dale, Md. The bulbs of P. I. 162443 were originally obtained from Sun Yat Sen Memorial Garden in Nanking, China, in 1948.

NOTES.—This plant is very important for the lycoris breeder since it will contribute a more frost resistant constitution along with yellow flowers.

LYCORIS ELSIAE

SAM CALDWELL, *Tennessee*

In 1957 HERBERTIA, Fig. 18 of an un-named *Lycoris* species was pictured. Since that date, the species has been named *Lycoris elsiae* Traub, in honor of Dr. Elsie Quarterman, Director of the HERBERIUM OF VANDERBILT UNIVERSITY, Nashville, Tenn., who has assisted materially in preserving authentic dried specimens of the *Lycoris* species in cultivation in the United States.

The quest for a truly white lycoris has led me over the years to acquire numerous samples of bulbs described by dealers as having white or lightly tinted flowers. Enough of these trial plantings have not bloomed to justify one interesting conclusion. Though the bulbs came under six different names and from as many different sources, most of them have turned out to be apparently the same thing—a most beautiful lycoris with the general flower form of *L. radiata* but a coloring that is a delicate blend of pink, salmon and yellow tints. During the early 1950's this lycoris was in fairly good supply—from Japanese sources, I believe—among the bulb dealers in this country.

I have wondered what to call it, because the flowers don't fit well under the description of any species or variety recognized by Traub & Moldenke in ''AMARYLLIDACEAE: TRIBE AMARYLLEAE'' (1949), or in Dr. Traub's new key to the species of *Lycoris* in 1957 HERBERTIA. I am pleased that it has now been appropriately named, *Lycoris elsiae.*

Lycoris elsiae has very much the same growth habits as *L. radiata.* For me it usually flowers around the first of September. Leaves come up as the flowers fade away, and the green leaf clumps persist until spring, just as in the case of *radiata.* Leaves on my bulbs of *Lycoris elsiae* run generally a little larger than on *radiata* bulbs, especially on those planted in pots and kept in the cold greenhouse.

Unfortunately, the leaves are definitely more susceptible to cold damage than those of *L. radiata.* I can hardly rate this as a ''hardy'' lycoris in the middle Tennessee area, since our near zero winter temperatures ''burn'' the blade tips and sometimes shrivel and whiten the leaves for half their length. This, of course, results in few flowers the next fall. I have more than 25 well established mature bulbs planted outdoors and yet feel fortunate when as many as three or four of the beautiful blooms show up in September. Thus far the pot grown bulbs have been erratic in bloom production. They make profuse foliage clumps in the cold greenhouse and some years give a scape or two, but are not reliable in flowering.

During the 1955-1956 winter I inverted an old aquarium and two large glass jars over outdoor clumps of *Lycoris elsiae*, hoping that the improvised cloches might protect their leaves. The foliage did come through the winter in rather better condition than unprotected leaves nearby; also, two of the three protected clumps produced blooms in September, 1956, while no other bulbs of *Lycoris elsiae* flowered for me. However, it will take several more years of testing to determine just how helpful the glass covers are.

The early September scapes push up to 18 or 19 inches high—a little taller than most of my *L. radiata* blooms—and the flowers of *Lycoris elsiae* are noticeably larger than those of *radiata.* Mine have had six or seven flowers to the umbel, the entire umbel with pistils and stamens radiating outward measures six to seven and a half inches across. Fig. 18 in 1957 HERBERTIA gives a clear representation of the flower form.

The coloring is what our garden club ladies will call ''lovely''—illusive soft tints of salmon, with the deepest pinkish shading in a band along the center of each segment. Cream and yellow tints blend with the pink, and the flowers gradually fade to a flesh color as they age.

This lycoris should be particularly popular in the middle and lower South and other areas with similar mild climates.

It is of some interest to note the different names under which I have received my bulbs: (1) ''L. radiata albo,'' from Rex Pearce, Moorestown, N. J., November, 1950; (2) ''L. radiata carnea,'' also from Pearce, November, 1951; (3) ''L. alba,'' from Wyndham Hayward, Winter Park, Fla., who had secured them as Japanese imports from the San Francisco Nurserymen's Exchange, November, 1951; and (4) ''L. albiflora carnea,'' from Cecil Houdyshel, La Verne, Calif., September, 1952. These have all bloomed one or more times, but not all together. However, to the best of my ability to observe, they are identical. It is possible that there may be minor variations in the intensity of color among various individuals, but not more than would be accounted for by variations in light and temperature conditions at flowering time. In general, the color has been strongest when cool, cloudy weather prevailed as the buds opened.

I should add that not *all* of my ''white'' or pale lycoris have conformed to the type of *Lycoris elsiae.* One received from Mr. Houdyshel in August, 1950, as *L. albiflora,* bloomed that same year in September—a little 12″ scape with six ''off white'' or ivory colored flowers in an umbel similar to the *L. radiata* blooms, but smaller than *radiata.* This was USDA stock, according to Mr. Houdyshel, and I presume it is the true *L. albiflora.* My bulbs never bloomed again—they have deteriorated badly, although a few persist and send up a few puny leaves each fall.

Another bulb, labeled ''L. radiata alba,'' came from Bob Anderson, of Los Angeles, in July, 1948. It had a small flower in September of that year—about the size and shape of L. radiata blooms—but tinted apricot, much like the coloring of *Lycoris elsiae.* It, too, has multiplied sparingly and several small bulbs remain, though they have never become strong enough to bloom again. Undoubtedly this lycoris and the one mentioned just previously will flower in a milder climate; my failure with them seems due to our cold winters.

Two other lots of bulbs are still to flower. One group, received from Growers Exchange, Farmington, Michigan, in October, 1952, as ''L. alba'' from Japan, has grown outdoors since then, and from the appearance of the foliage I am expecting it to be *Lycoris elsiae.* The other lot came in July, 1955, from Noel Morey, then of Aptos, Calif.

With the bulbs Mr. Morey wrote, ''I was very fortunate to get these *L. albiflora* bulbs in the fall of 1954 from Mr. O. E. Orpet. They evidently are fertile, as Mr. Orpet says he grew them from seed, and they are probably not in commerce.'' These have not bloomed for me but they have made good foliage.

Incidentally, I have never been able to set seed on *Lycoris elsiae* or any of the others discussed above, in spite of numerous attempts, both selfing and cross-pollinating the blooms. I feel that there are many uncertainties in the stocks of white and near-white lycoris, and it will be years before we can get the taxonomy of these straightened out. Meanwhile, it's an intriguing hobby to keep working with them.

CROSSES INVOLVING RHODOPHIALA, HABRANTHUS AND ZEPHYRANTHES

HAMILTON P. TRAUB

A first report on these crosses appeared several years ago (Traub, 1952). Since that date the progenies have been grown outdoors in California so that ample herbarium material has been accumulated and the plants have been studied in detail from living specimens. The purpose of the present paper is to describe and name these hybrids.

(1) RHODOPHIALA HYBRIDS

Several years ago, *Rhodophiala bifida,* vars. *bifida* (red), and *spathacea* (lavender pink), both from Argentina, were crossed with *R. chilensis* (pale yellow), from Chile, and abundant offspring were obtained. This was not unexpected since Ficker (1951) had shown that the chromosome numbers of these two species are the same, $2n=18$.

These first generation seedlings have now been tested outdoors in California and have proved to be fertile. The summer-flowering habit of *R. chilensis* is dominant over the autumn-flowering character of *R. bifida,* but the red or pink flower color of the latter is dominant over the pale yellow color of the former.

The second generation seedlings obtained by selfing the first generation hybrids are thriving and soon should reach the flowering stage when an additional report will be made on the segregation of characters in the individual offspring.

The hybrid has been named *Rhodophiala* x *lajolla* for the location where the progeny have been extensively tested.

Rhodophiala x **lajolla** Traub, **hybr. nov.**

Planta inter *R. bifida* et *R. chilensis* hybrida; foliis linearibus usque ad 71 cm. longis, 7 mm. latis, ad apicem subrotundatis; spathe bivalvata vel tantum unilateraliter usque ad basin fissa; umbella 4—7-flora, raro 2-flora; pedicellis 3.7—5.5 cm. longis; perigonio rubello vel rubro; tubo tepalorum 4 mm. longo; segmentis tepalorum lanceolatis 5.1 cm. longis, 7—11 mm. latis; staminibus usque ad 4 longitudines perventis, quam segmentis tepalorum ca. dimidio brevioribus; stylo quam segmentis tepalorum ¼ breviore; stigmate trifido.

DESCRIPTION.—*Leaves* 5—8, linear, concave on upper side, up to 71 cm. long, 7 mm. wide, apex roundish. *Scape* 18.5 cm. tall. *Spathe* 2-valved, or split to the base on one side only, lanceolate, 6—7.2 cm. long. *Umbel* 4—7, rarely 2-flowered. *Pedicels* 3.7—5.5 cm. long. *Perigone* red colored. *Ovary* 5—6 mm. long, 4—5 mm. in diam. *Tepaltube* 4 mm. long. *Tepalsegs* lanceolate, 5.1 cm. long, 7—11 mm. wide, apexes of setsegs acute, petsegs roundish. *Stamens* of four different lengths, slightly more than half as long as, and *style* about ¾ as long as, the tepalsegs. *Stigma* trifid.

Holotype: No. 605 (TRA), cult. 7-20-57, La Jolla, Calif., Hamilton P. Traub: PARATYPES: Nos. 299, & 607, cult. La Jolla, Calif. 1955 & 1957.

(II) RHODOPHIALA—HABRANTHUS HYBRIDS

Next crosses between *Rhodophiala bifida* vars. *bifida* and *spathacea*, ($x=9$; $2n=18$) and *Habranthus juncifolius* ($x=7$; $2n=14$), from Argentina, were made (Traub, 1952). The progeny obtained have been tested outdoors in California and have proved to be sterile. These data support the hypothesis that the two distinct genera, *Rhodophiala* and *Habranthus,* belong in the same tribe (ZEPHYRANTHEAE).

This bi-generic hybrid has been named X *Rhodobranthus woelfleana.* The generic name is derived from parts of the names of the parent genera, and the specific name honors Len Woelfle, who is much interested in the introduction and culture of *Rhodophiala* and *Habranthus* species.

X **Rhodobranthus** Traub, **hybr. gen. nov.** (Amaryllidaceae)
X **Rhodobranthus woelfleana** Traub, **hybr. nov.** (generic holotype)

DESCRIPTO GENERICO-SPECIFICA:—Planta inter *Rhodophiala* et *Habranthus* hybrida; foliis linearibus paulo complanatis fistulosis usque ad 64 cm. longis; spatha inferne connata, superne bifida vel fenestrata, vel tantum unilateraliter usque ad basin fissa; umbella 2—6-flora; pedicellis 5.5—9 cm. longis; perigonio pallido-lavandulaceo vel roseo vel rubro; tubo tepalorum 4 mm. longo; paraperigonio a fimbriis brevissimis constato; segmentis tepalorum lanceolatis 4.2—6.6 cm. longis, 1—1.3 cm. latis; staminibus declinato-adscendentibus usque ad 4 longitudines perventis, quam segmentis tepalorum plus dimidio brevioribus; stylo quam segmentis tepalorum ¼ usque ad dimidio brevioribus.

COMBINED GENERIC AND SPECIFIC DESCRIPTION.—*Leaves* 2—3, linear, somewhat flattened, hollow, furrowed on the upper side, up to 64 cm. long, 3—5 mm. wide, apex acutish or roundish. *Scape* 15—25 cm. tall. *Spathe* united below, upper part bifid or fenstrated; or split to the base on one side only, apex undivided; apex acute, 6—7.5 cm. long. *Umbel* 2—6-flowered. *Pedicels* 5.5—9 cm., rarely 2.5 cm. long. *Perigone* light lavender, Tyrian rose, to red. *Ovary* 7—8 mm. long, 3—5 mm. in diam. *Tepaltube* 4 mm. long, 4 mm. diam. at the base, 5 mm. diam. at the apex. *Paraperigone* of very short fimbriae at the base of the tepalsegs. *Tepalsegs* lanceolate, 4.2—6.6 cm. long, 1—1.3 cm. wide. *Stamens* declinate-ascending, of four different lengths, less than half to about half the length of the tepalsegs. *Style* half to ¾ as long as the tepalsegs. *Stigma* trifid.

HOLOTYPE: No. 602 (TRA), 9-11-57, cult. La Jolla, Calif., Hamilton P. Traub. PARATYPES: Nos. 369, 370 and 371, cult. Beltville, Md. 1950 & 1951; Nos. 600, 601, 603, and 604, cult. La Jolla, Calif. 1957.

(III) HABRANTHUS—ZEPHYRANTHES HYBRIDS

Attempts to cross *Rhodophiala bifida* with *Zephyranthes grandifloria* ($x=6$; $2n=48$; see Flory 1944), from Mexico (?), failed. But crosses between *Habranthus juncifolius* and *Zephyranthes grandiflora* were successful (Traub 1952). The progeny were tested outdoors in California and proved to be sterile.

Thus the chain, *Rhodophiala* x *Habranthus*, and *Habranthus* x *Zephyranthes* is completed, and this data lends support to the hypothesis that the three genera involved are closely related and belong together in the tribe ZEPHYRANTHEAE.

It is now in order to consider previously reported crosses of *Habranthus* and *Zephyranthes.*

(A) PIONEER WORK OF PERCY-LANCASTER

Working in India, Percy-Lancaster (1912-1913) carried further the experiments of his father, and he reported on a number of hybrids including (1) hybrids within the genus *Zephyranthes* (including *Cooperia)*, which latter have to be placed under *Zephyranthes* as hybrids, and (2) hybrids between *Zephyranthes* and *Habranthus* species, which have to be included under a new name.

All of these were included by Percy-Lancaster under the name X *Cooperanthes,* and no holotype was indicated. The name indicates that he based it on *Zephyranthes* and *Cooperia* and thus the lectotype has to be selected from the hybrids under (1) above. Traub (1954) separated these two classes of hybrids.

Hybrid **Zephyranthes**

For purposes of nomenclature, a part of the taxon, X *Cooperanthes* (Percy-Lancaster, 1912-1913) is typified by X *Cooperanthes blanda* Percy-Lancaster (Jour. Roy. Hort. Soc. 38: 531. 1912-1913), as the lectotype, and includes that portion of the taxon produced by crossing species within the genus *Zephyranthes* (including *Cooperia)*, since *Cooperia* cannot be separated from that genus on biological grounds. Thus all of these and similar hybrids are placed under *Zephyranthes,* and the name X *Cooperanthes* Percy-Lancaster *ex parte* becomes a synonym of *Zephyranthes.*

X Sydneya Traub; **Zephyranthes—Habranthus** hybrids

This leaves that portion of X *Cooperanthes* Percy-Lancaster that covers the hybrids between *Zephyranthes* and *Habranthus* without a name. Traub (1954) proposed the new name, X *Sydneya* (in honor of Mr. Sydney Percy-Lancaster) to cover this part of the taxon. The holotype was indicated as X *Sydneya lancastrae* Traub (Plant Life 10: 47. 1954), syn.—X *Cooperanthes lancastrae* Percy-Lancaster, in Jour. Roy. Hort. Soc. 38: 531. 1912-1913 [*Zephyranthes brazosensis* Traub x *Habranthus robustus* Lodd. ex Herb. (err. *H. tubispathus* (L'Hérit.) Traub), Plant Life 10: 47. 1954].

X Sydneya Traub, Hybr. **gen. nov.** (Amaryllidaceae)
X Sydneya lancastrae (Lancaster) Traub (generic holotype)
(Plant Life 10: 47. 1954.)

Descripto generico-specifica:—Plantae inter *Zephyranthes* et *Habranthus* hybridae, signis parentes intermediis praeter perigonio non zygomorphe et staminibus usque ad 2 longitudines perventis.

(B) X SYDNEYA CASTELLANOSII

The inter-generic hybrid, *Habranthus juncifolius* x *Zephyranthes grandiflora,* referred to at the beginning of Section III, belongs under X *Sydneya.* The hybrid has been named in honor of Dr. Castellanos of Buenos Aires, Argentina, who sent the bulbs of *Habranthus juncifolius* which were used in the breeding experiments.

X Sydneya castellanosii Traub, **hybr. nov.**

Planta inter *Zephyranthes grandiflora* et *Habranthus juncifolius* hybrida; foliis linearibus usque ad 40 cm. longis 6—11 mm. latis; spatha inferne connata, superne non divisa, vel bifida; umbella 1-flora; pedicellis 3.3—6 cm. longis; perigonio rubello, intus albido, vel carmineo—roseo; tubo tepalorum 7—8 mm. longo; paraperigonio a setis paucis brevibus constato; segmentis tepalorum 6—7 cm. longis; staminibus usque ad 2 longitudines perventis, quam segmentis tepalorum dimidio brevioribus; style quam segmentis tepalorum ¼ breviore; stigmate trifido.

DESCRIPTION.—*Leaves* linear, flat, 25—40 cm. long, 6—11 mm. wide, apex acutish. *Scape* 17—32 cm. tall. *Spathe* united below, upper not divided, or bifid, apex acute, 3.2—3.8 cm. long. *Umbel* 1-flowered. *Pedicel* 3.3—6 cm. long. Perigone slightly declined, pink, whitish within, or carmine rose. *Ovary* 8 cm. long, 4 mm. in diam. *Tepaltube* 7—8 mm. long. *Paraperigone* of a few short bristles at the base of the tepalsegs. *Tepalsegs* oblanceolate, 6—7 cm. long, width variable, 1—1.8 cm., 1.6—2 cm., or 1.8—2.2 cm. wide, apex acute or roundish. *Stamens* of two different lengths, about half as long as the tepalsegs. *Style* about ¾ as long as the tepalsegs. *Stigma* trifid. *Capsule* 1.4 cm. long, 1.9 cm. in diam. *Seeds* numerous, blackish, discoid or D-shaped, flat, sterile.

HOLOTYPE: No. 606 (TRA), cult. Hamilton P. Traub, La Jolla, Calif., 7-24-57. PARATYPES: Nos. 364, 365, 366, 367, & 368, cult. Hamilton P. Traub, Beltsville, Md., 1951 to 1952.

(IV) RHODOPHIALA EXCLUDED FROM AMARYLLIS L.

It has been shown that *Rhodophiala bifida* is related to *Habranthus juncifolius* to the extent that sterile hybrids can be obtained by crossing. They are morphologically distinct. This lends support to the hypothesis that although they are closely related, *Rhodophiala* and *Habranthus* are in fact two distinct genera in the tribe ZEPHYRANTHEAE.

In the present experiments, *Rhodophiala bifida* could not be crossed with *Zephyranthes grandiflora* which shows that these two genera have diverged to such an extent as to preclude crossing. But a link between the two has been established by another experiment reported under (III) above, when *Habranthus juncifolius* (which crosses with *Rhodophiala bifida)* was crossed with *Zephyranthes grandiflora,* again with sterile offspring. Thus the three general are each distinct from one another but apparently belong together in the tribe ZEPHYRANTHEAE.

Baker (1888) had reduced the genus *Rhodophiala* Presl to a synonym of *Amaryllis* L. (under the synonym *Hippeastrum)* on the basis of gross morphological characters. This is understandable since chromosome data and the results from breeding experiments were not available to him. We now know that in *Amaryllis* L. (x=11; 2n=22, 44, 66 chromosomes; see Traub, 1958) crosses between other species in the genus proper having similar chromosome numbers, in most cases, can be obtained as a rule with fertile offspring. This shows very close relationship within the genus proper. However, when attempts were made to cross *Amaryllis* L. (x=11) with *Rhodophiala* (x=9), *Habranthus* (x=6, 7) and *Zephyranthes* (x=6, 7) species, all of them uniformly failed. This has been the experience of others also.

Amaryllis L. (x=11) and *Rhodophiala* (x=9) differ markedly in their basic and somatic chromosome numbers which apparently precludes crossing, but have similar floral characters which have apparently evolved along parallel lines. However, *Amaryllis* L., in the tribe AMARYLLEAE, is relatively larger in all its parts and has relatively broader sessile or petiolate leaves whereas *Rhodophiala*, in the tribe ZEPHYRANTHEAE, has relatively narrow sessile linear leaves. Thus the genera can be readily distinguished as taxons, and chromosome data and breeding experiments as already indicated show that they are not closely related. On that basis *Rhodophiala* has been restored as a distinct genus (Traub, 1953).

LITERATURE CITED

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ROBUST FORM OF CRINUM AMERICANUM?

HAMILTON P. TRAUB

On July 5, 1952, Mrs. Ruth Patrick Hodge collected living specimens of *Crinum americanum* 5 miles north of Beaumont, Hardin County, Texas, and sent them to Mrs. Mary G. Henry, who sent some of the bulbs to the writer for study. Mrs. Hodge noted that the plant was stoloniferous, with elongated bulbs, 6 cm. long, 2.2 cm. in diameter.

A detailed study has been made of these bulbous plants since 1952. Part of them are the typical *Crinum americanum* L., which is the type of the genus *Crinum,* and these go dormant in winter. However, one of the plants is much more robust, the leaf margins are hyaline and provided with minute teeth, and it retains its leaves through the winter (Fig. 7). The umbel is 7-flowered. The fruit is extra large and is provided with an antenna-like projection reminiscent of an antenna of a space satellite. The antenna-like structure represents 4/5 of the tepal-tube which remains alive after the flower has faded. The seeds are extra large (Fig. 7). Further study will be needed to determine the identity of this plant.

Some of the seeds are being sent to Dr. Flory for chromosome determinations since the robust plant stature may be connected with polyploidy, and only such determinations can settle that point. Another report will be made after the chromosome study has been completed.

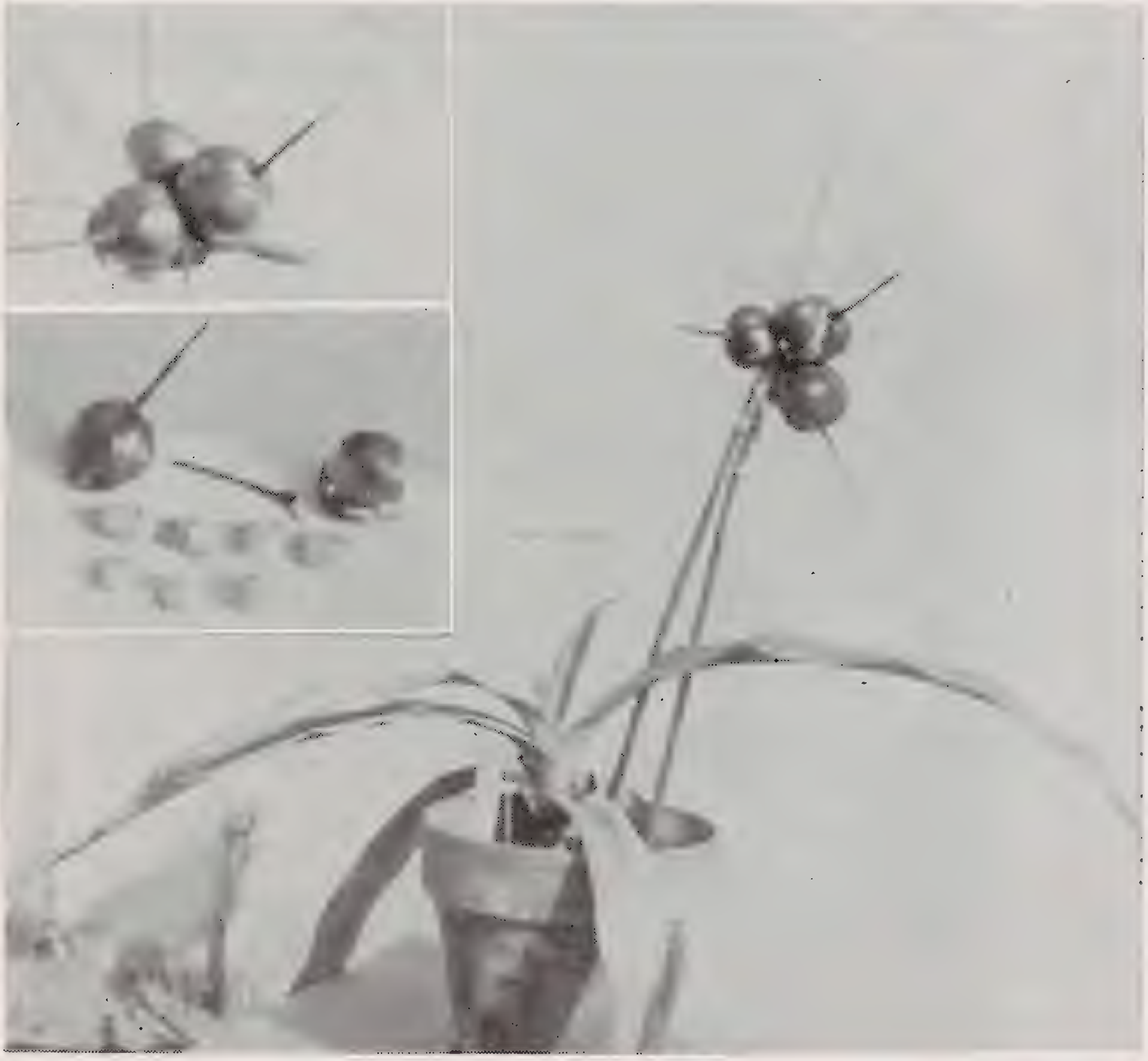


Fig. 7. Robust form of *Crinum americanum,* from Beaumont, Texas, showing that the plant had retained its leaves (Nov. 1957), when the typical form in the same pot had already gone dormant. Insets in upper left hand corner: *upper,* close-up of a cluster of fruits; *lower,* single fruit, and dissected fruit, showing seeds, pericarp and antenna-like projection.

REGISTRATION OF NEW AMARYLLID CLONES

Registrar: Mr. W. D. Morton, Jr.

This department has been included since 1934 to provide a place for the registration of names of cultivated *Amaryllis* and other amaryllids. The procedure is in harmony with the INTERNATIONAL CODE OF BOTANICAL NOMENCLATURE (edition publ. 1956) and the INTERNATIONAL

Code of Nomenclature for Cultivated Plants (edition publ. 1953). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, "Descriptive Catalog of Hemerocallis Clones, 1893-1948" by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $2.50 prepaid from: Dr. Thos. W. Whitaker, Executive Secy, The American Plant Life Society, Box 150, La Jolla, Calif. A catalog of Amaryllis names, and also a catalog of the names of other cultivated amaryllids, is scheduled for publication in 1959 Herbertia.

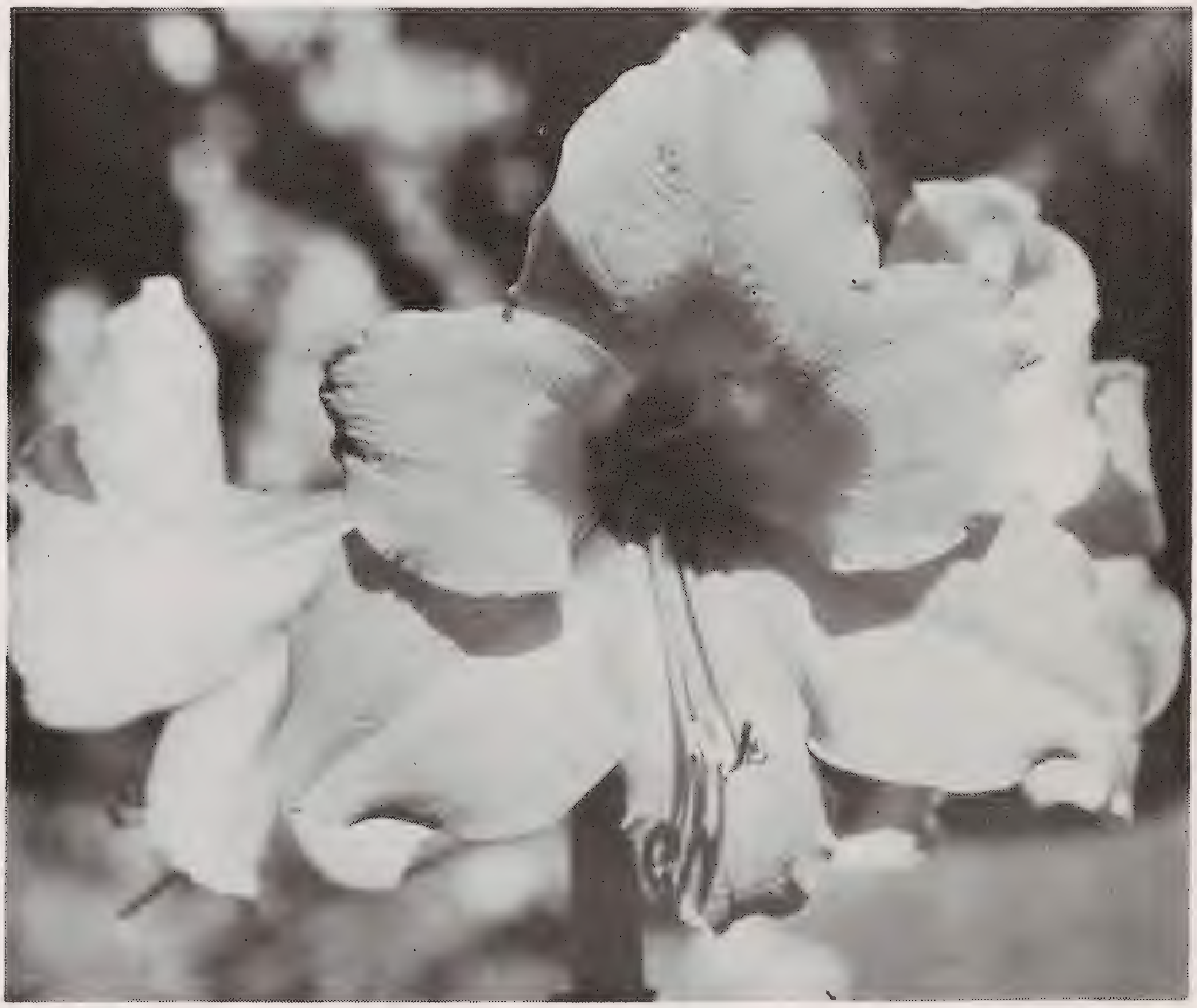


Fig. 8. Hybrid *Amaryllis* cl. 'La Forest Morton' (Ludwig, 1956). Photo New Orleans Times Picayune; Mrs. Rachel Daniels, Garden Editor.

Only registered clones of Amaryllis and other amaryllids are eligible for awards and honors of the American Amaryllis Society. Numbers of registered clones are preceded by a prefix, an abbreviation for the genus concerned. Thus, A-390, the "A" standing for *Amaryllis;* Z-1, the "Z" standing for *Zephyranthes,* etc.

Correspondence regarding registration of all amaryllids such as *Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,* and so on, should be addressed to: Mr. W. D. Morton, Jr., Registrar, 3114 State Street Drive, New Orleans 25, Louisiana. The registration fee is $2.00

for each clone to be registered. Make checks payable to AMERICAN PLANT LIFE SOCIETY.

HYBRID AMARYLLIS CLONES

Introduced by Ludwig & Co., Hillegom, Netherlands:

'La Forest Morton' (Ludwig, 1956). [Fig. 8] Registration No. A-390; date: 11-3-57; introduction date: 1956. Height 26″; spring flowering; Leopoldii (D-5b), 7½″ across face; color china rose (024/1 RHS) changing to deeper color, lilac purple (031/1), close to pansy purple (033), and almost black at bottom of throat. Named in honor of the late Mrs. W. D. (née La Forest Smith) Morton, Jr. See also preliminary announcement, page 66, in 1956 HERBERTIA.

Introduced by Harry St. John, 2614 Holley Grove, New Orleans, La.—

'Harry St. John' (St. John, 1957). Leopoldii 5b; scape 20″; flower length 5″; diam. across face 7″; dark red, deeper red throat; tepalsegs pointed and reflexed; plant evergreen, blooming season, March. A clone raised 30 years ago; parentage not known. (Reg. No. A-391; 11-13-57). Distributed 7-8-56.

Introduced by Mrs. John Klein, Jr., 2504 Mistetoe, New Orleans 18, La.—

'Klein Pink' (Klein, 1957). Leopoldii 5a; scape 26″; flower length 4″, diam. across face 8″; pink to tip of tepalsegs, light green throat, tepalsegs reflexed; plant evergreen, blooming season spring. From Holland grown seeds. (Reg. No. A-392; 11-13-57). Distributed 7-8-56.

Introduced by M. Van Waveren & Sons, Hillegom, Holland:

'Kathleen Ferrier', pure white, distributed 1956, registered 2-15-58
'Royal Velvet', deep red to purple, distributed 1956, registered 2-15-58
'Salmon Beauty', salmon pink, distributed 1956, registered 2-15-58
'Modern Times', deep blood red, distributed 1956, registered 2-15-58
'Snowstorm', pure white, distributed 1956, registered 2-15-58

Complete descriptions of these five clones will be included in 1959 HERBERTIA.

Introduced by S. P. Gasperecz, 1219 Short St., New Orleans, La.—

'Susie Pink'. Leopoldii 5a. 28″ tall; flower 7½″ diam. (Rose Madder 23; light greenish throat); mildly fragrant; parentage ('Crimson Beauty' x 'Pink Perfection'); March; evergreen. Registered: No. 398; April 26, 1958; Introduced, 4-13-58.

'Amita'. Leopoldii 5b. 30″ tall; flower 7½″ diam., rose bengal 25, narrow stripe in center of segs; mildly fragrant; parentage: 'Doris Lillian' x 'Pink Perfection'; March; evergreen. Registered: No. 399, 4-26-58; introduced 4-13-58.

'Baby Pink'. Leopoldii 5b. 26″ tall; flower 6½″ diam.; solferino purple 26/3, light greenish throat; mildly fragrant; parentage: 'Pink Favorite' x 'White Giant'; March; evergreen. Registered: No. 400, 4-26-58; introduced 4-13-58.

Introduced by Mrs. Margie Clements, 703 Ridgewood Drive, Metairie, La.—

'Margie Clements'. Double. 22″ tall; flowers 5½″ diam., dutch vermilion 717, segs of four layers, overlapping, pointed and reflexed; parentage: 'American Trumpet' x *Amaryllis belladonna* var. *plena* (Cuban clone); spring; evergreen. Registered and Introduced: No. 401, 5-5-58.

Introduced by R. E. Duggan, 6864 Milne St., New Orleans 24, La.—

'Dr. Johns." Belladonna type. 24″ tall; flowers 7½″ diam.; cardinal red 822, segs much reflexed; mildly fragrant; parentage: Mead strain cross; spring; evergreen. Registered: No. 402; introduced, March 1954. A very prolific bloomer, 3 to 4 scapes per bulb each season.

'Stella.' Double. 22″ tall; flowers 7″ diam., geranium lake 20; three rows of segs overlapping, reflexed, margins ruffled, darker colored in throat; parentage 'Dr. Johns' x *Amaryllis belladonna* var. *plena* (Cuban clone); spring; evergreen. Registered and Introduced: No. 403, 5-5-58.

Introduced by Henry P. Fontcuberta, 2717 Cleveland Ave., New Orleans, La.—

'Audrey'. Leopoldii 5b. 24" tall; flowers 6" diam.; rose opal 022, whitish-greenish throat; segs reflexed; mildly fragrant; parentage: Mead strain crimson 22 x 'Pink Perfection'; spring; evergreen; Registered: No. 405, 5-5-58; Introduced, 4-13-58.

Introduced by Tim Calamari, 1623 Pauger St., New Orleans 16, La.—

'Timmy'. Leopoldii 5b. 26" tall; flowers 5½" diam.; 3½" length; cherry red, 722, tips recurved, segs with light whitish margin, faint white stripe in center, velvety appearance; mildly fragrant. Parentage: Dutch orange x Mead red, white throat. Spring; evergreen. Registered: No. 404, 5-3-58; introduced 4-12-58.

Introduced by M. Van Waveren & Sons, Hillegom, Netherlands:

'Clown'. White striped vivid red. Registered: No. 406, 7-12-58.

'Fulda'. Orange scarlet. Registered: No. 407, 7-12-58.

'House of Orange'. Flaming orange. Registered: No. 408, 7-12-58.

'Morning Kiss'. Salmon pink. Registered: No. 409, 7-12-58.

'Northern Queen'. Salmon orange, tinted carmine red. Registered: No. 410, 7-12-58.

'Queen of Scarlets'. Brilliant scarlet. Registered: No. 411, 7-12-58.

'Red Champion'. Deep brilliant red. Registered: No. 412, 7-12-58.

'Red Guard'. Deep scarlet. Registered: No. 413, 7-12-58.

'Red Lion'. Dark red. Registered: No. 414, 7-12-58.

'Rose Queen'. Fine old rose, slightly darker throat. Reg.: No. 415, 7-12-58.

'Salmon Giant'. Warm coppery salmon pink. Registered: No. 416, 7-12-58.

'Salmonea'. Delicate light pink. Registered: No. 417, 7-12-58.

'Scarlet Leader'. Deep scarlet-red, darker red spot in center. Reg.: No. 418, 7-12-58.

'Scarlet Pimpernel'. Pure scarlet. Registered: No. 419, 7-12-58.

'Senator Wallace'. Beautiful rose, shaded white. Registered: No. 420, 7-12-58.

Complete descriptions of these 15 clones will be included in 1959 HERBERTIA.

Introduced by Ludwig & Co., Hillegom, Holland—

The following registrations as of August 1, 1958 were received too late for inclusion of the descriptions in this issue of HERBERTIA. The descriptions will be included in 1959 HERBERTIA. The names and registration numbers follow:

'American Express' No. 421; 'Apple Blossom' No. 422; 'Bridesmaid' No. 423; 'Bouquet' No. 424; 'Brilliant' No. 425; 'Candy Cane' No. 426; 'Champion's Reward' No. 427; 'Daintiness' No. 428; 'Delilah' No. 429; 'Diamond' No. 430; 'Doris Lillian' No. 431; 'Fantasy' No. 432; 'Franklin Roosevelt' No. 433; 'Five Star General' No. 434; 'Halley' No. 435; 'Helen' No. 436; 'Invincible' No. 437; 'Love's Desire' No. 438; 'Ludwig's Dazzler' No. 439; 'Ludwig's Masterpiece' No. 440; 'Ludwig's Scarlet' No. 441; 'Ludwig's Goliath' No. 442; 'Lucky Strike' No. 443; 'Margaret Rose' No. 444; 'Maria Goretti' No. 445; 'Margaret Truman' No. 446; 'Mothersday' No. 447; 'Nivalis' No. 448; 'Peacefulness' No. 449; 'Pink Favorite' No. 450; 'Pink Perfection' No. 451; 'Pinksterflower' No. 452; 'Roselinde' No. 453; 'Rossini' No. 454; 'Salmon Joy' No. 455; 'Shakespeare' No. 456; 'Red Radiance' No. 457; 'Silver Lining' No. 458; 'Siren' No. 459; 'White Giant' No. 460; 'Winter Joy' No. 461; 'Wyndham Hayward' No. 462.

HYBRID ZEPHYRANTHES CLONE

Introduced by Dr. Thad M. Howard, 307 W. Jones Ave., San Antonio, Texas—

'Ruth Page' (Howard, 1958). A hybrid between *Z. rosea* (seed parent) and *Z. citrina.* A vigorous clone, similar in habit to the seed parent, but half again as large in its floral parts; the foliage is more upright; long declinate style; pedicel 1¼ to 1½ inches long, tepaltube a half inch long, mature bulbs nearly an inch in diameter; offsets produced freely, Registration No. Z-1. The registration was received too late for the inclusion of a picture of the clone, which will appear in 1959 HERBBERTIA.

[PLANT LIFE LIBRARY—continued from page 139.]

COLOR IN THE WINTER GARDEN, by G. S. Thomas. Chas. T. Branford Co., 69 Union St., Newton Centre, Mass. 1958. Pp. 220. Illus. $6.50. The author, a well known professional English horticulturist, describes a considerable number of trees, shrubs, and herbaceous and bulbous plants which are available to provide color in bloom, berry and foliage in gardens in winter. Cultural requirements, uses in arrangements, flowering and planting periods of the plants are discussed. This most charming book is highly recommended.

PLANT PATHOLOGY, by J. C. Walker. 2nd ed. McGraw-Hill Book Co., New York. 1957. Pp. 707. Illus. $10.00. This is a revised edition of Dr. Walker's outstanding text which presents "comprehensive treatments of better-known representative diseases which may serve as guides to the general principles underlying the science of plant pathology." This is a must for all who are interested in plant pathology.

VEGETABLE CROPS, by H. C. Thompson and W. C. Kelly. 5th. ed. McGraw-Hill Book Co., New York. 1957. Pp. 611. Illus. $8.50. The purpose of this 5th edition of the standard text on the subject is to acquaint "the student with the facts and principles on which successful production and handling of vegetables are based." It serves "equally as well as a college text book, or as a reference book for county agricultural agents, extension specialists, teachers of vocational agriculture. seedsmen and other commercial concerns that have contact with the vegetable industry." The text has been brought up-to-date and is highly recommended.

FUNDAMENTALS OF HORTICULTURE, by J. B. Edmond, A. M. Musser, and F. S. Andrews. 2nd ed. McGraw-Hill Book Co., New York. 1957. Pp. 456. Illus. $6.75. This second edition of an excellent book is divided into three parts—a study of the fundamental processes; the application of these to horticultural practices, and a discussion of the principal horticultural crops. Highly recommended.

SOILS AND SOIL FERTILITY, 2nd ed., by L. M. Thompson. McGraw-Hill Book Co., New York. 1957. Pp. 451. Illus. $6.50. This second edition of a well-known text deals with the "physical, biological and chemical properties of soils in relation to their formation, classification, and management from the fertility point of view." This clearly written text is "general enough to meet the needs of college students who take only one course in soils" and it is "also sufficiently technical to serve the needs of the graduate student." Highly recommended.

THE NORTH AMERICAN DESERTS, by E. C. Jaeger, Stanford University Press, Stanford, Calif. 1957. Pp. 308. Illus. $5.95. The purpose of this excellent text is to present for the first time "a comprehensive yet simple picture of all of our North American deserts, deserts five in number which together extend from central Mexico almost to the border of Canada." This charming and informative book, profusely illustrated, will appeal to all who are interested in desert living and travel, and it cannot be too highly recommended.

A MANUAL OF AQUATIC PLANTS, by N. C. Fassett. University of Wisconsin Press, Madison. 1957. Pp. 405. Illus. $6.50. This edition of the late Dr. Fassett's classic text is published with the revision Appendix by Eugene C. Ogden with the purpose of bringing the nomenclature into agreement with present day usage, supplementing some of the keys, and extending the ranges of many species. The Manual covers the region from Minnesota to Wisconsin and eastward from the Gulf of St. Lawrence to Virginia. Highly recommended.

SPRING FLORA OF WISCONSIN, by N. C. Fassett. 3rd ed. with revisions by Margaret S. Bergseng. University of Wisconsin Press, Madison. 1957. Pp. 189. Illus. This is a revision of the late Dr. Fassett's manual of plants growing without cultivation and flowering before June 15 which had not been completed at the time of his death. The revision was completed by his colleagues. Botanists generally will welcome this clearly and concisely presented work so characteristic of Dr. Fassett. Highly recommended.

[PLANT LIFE LIBRARY—continued on page 110.]

AMARYLLID NOTES, 1958

Hamilton P. Traub

CORRIGENDA

Traub, Hamilton P. AMARYLLIDACEAE, in João Angely, Catalogo e Estistica dos Generos Botanicos Fanerogamicos. No. 26. 1957:

Page 3, under ALLIUM L., delete "Nectaroscordum Lindl. (1836)."

Page 4, under BESSERA Schult. f, delete "Bessera Schult. (1809); Bessera Spreng. (1815); Bessera Vell. (1825)."

Page 7, under STENOMESSON Herb., add under "Sin.", "Crocopsis Pax (1890)."

Page 7, under TULBAGHIA L., delete "Tulbaghia Heist. (1753)."

Page 7, under VALLOTA Herb., delete "Valota Adans. (1763)."

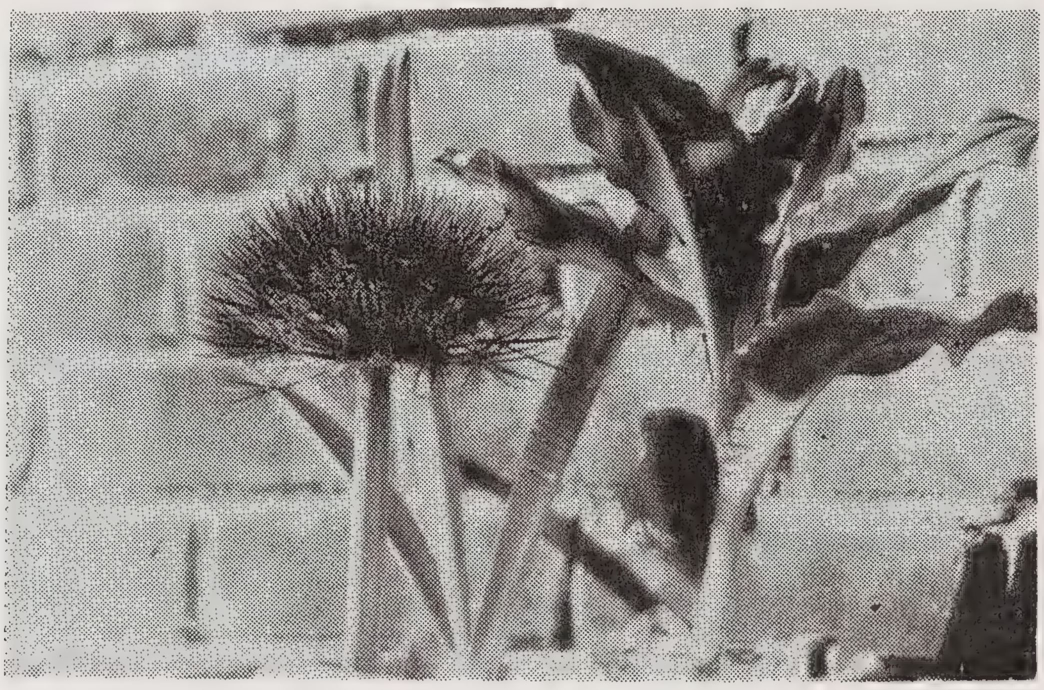


Fig. 10. *Haemanthus zambesiacus* from Southern Rhodesia, flower on left, foliage on right. *Eucomis undulata* with linear leaves in background. Photo by L. S. Hannibal.

HAEMANTHUS ZAMBESIACUS

In a recent communication, Mr. L. S. Hannibal sent in a photo of *Haemanthus zambesiacus* which is reproduced in Fig. 10. This species is from Southern Rhodesia. The reader is referred to page 55, 1956 Herbertia for a brief description of this species by Mr. Hannibal.

AMARYLLIS BREVIFLORA (HERB.) SWEET

Amaryllis breviflora (Herb.) Sweet. Baker (Amaryll. 1888) was apparently in error in indicating the habitat of this species as "Buenos Aires, *Tweedie*". Herbert (Amaryll. 137. 1837) had previously indicated "Specim. Herb. Hooker (ex Braz. meridionali?) *Tweedie*". A specimen from Santa Catarina, southern Brazil, recently identified favors Herbert's statement. This is Reitz & Klein No. 1298, 11-5-53 (US No. 2,142,544), Campo do Massiambú.

AMARYLLIS VITTATA VAR. TWEEDIANA

In 1954, Prof. Ira S. Nelson, while on a collecting trip sponsored by the Louisiana Society for Horticultural Science, sent back bulbs of this species which is illustrated in Fig. 9. This is really a very beautiful species—the illustration does not do it justice—and has to be seen to be fully appreciated. It has been previously illustrated by Traub & Nelson in Bulletin No. 2, Louisiana Society for Horticultural Research. 1957.

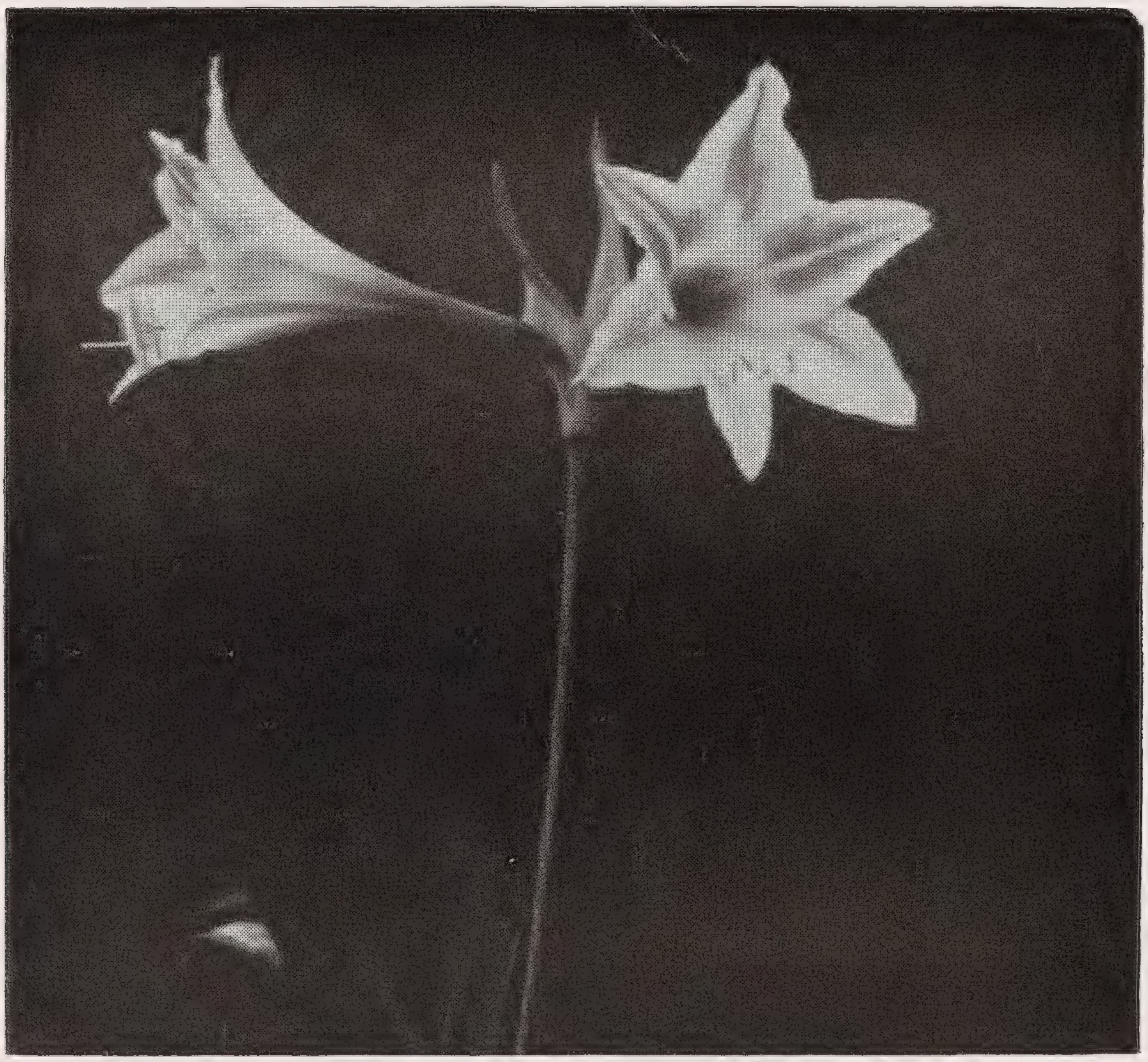


Fig. 9. *Amaryllis vittata* var. *tweedieana.* Photo by Prof. Ira S. Nelson.

Amaryllis vittata var. **tweediana** Traub

in The Amaryllis Manual, Macmillan, N. Y. p. 268. 1958. Syn.—*Hippeastrum ambiguum* var. *tweedianum* (err. *tweediana)* Herb., in Bot. Mag. sub pl. 3542. 1837; Herb., in Amaryll. 136, pl. 22 (err. 21), fig. 3. 1837 (specim. Herb. Hooker. S. Brasil? Tweedie).

Description.—*Leaves* lanceolate, 1.5 cm. wide at the base, 2.5 cm. wide above the middle, 46.5 cm. long. *Scape* 22.5 cm. tall. *Umbel* 2-flowered. *Spathe-valves* lanceolate, 8.7 cm. long, apex acute. *Pedicels* 2.5 cm. long. *Ovary* 2.2 cm. long, 1 cm. in diam. *Perigone* 14.5—15.5 cm. long. with two deep purple stripes, with white stripe between, or purplish in center, white outwards, on each tepalseg. *Tepaltube* 4 cm. long, 6 mm. in diam. at the base, 11 mm. in diam. at the apex. *Tepalsegs* oblanceolate, acute or acuminate, 11 cm. long; upper setseg 5 cm. wide, two side setsegs 4cm. wide; two side petsegs 4.4. cm. wide, lower petseg 3 cm. wide, *Stamens*

2.5 cm. shorter than the *style,* which subequals the tepalsegs. *Stigma* trifid, lobes 2.5 mm. long, rounded.

Specimen No. 423 (TRA), Nelson, 2-13-56, cult. Lafayette, La., grown from bulbs obtained by Ira S. Nelson in 1954 from Ricardo Dillman in Cochabamba, Bolivia. The original bulbs were obtained by Mr. Dillman from the Rio Beni region some years previously.

CAPE BELLADONNA, BRUNSVIGIA ROSEA (LAM.) HANN.

In 1955 Mr. L. S. Hannibal kindly sent the writer Cape Belladonna *(Brunsvigia rosea* (Lam.) Hann.) bulbs Stanford Nos. 1 and 2, representing selections from the wild near Stellenbosch in South Africa by the late Miss K. C. Stanford.

In August 1957 No. 2 bloomed at La Jolla, Calif. The scape was 40 cm. tall; the umbel was 6-flowered, with 2 abortive buds. The flowers were very light pink, becoming a little deeper pink with age. The flowers were not hand pollinated, but in spite of this a very good crop of seeds set (24 seeds per capsule), apparently due to pollen transfer by the humming bird moth. The petioles had elongated to 9.5—13 cm. long in fruit; the capsules were 3.6 cm. long, 2.1 cm. in diam. The seeds were whitish when harvested, but changed to pinkish when exposed to the sun. They were fleshy, angular, ranging from 5 x 7 mm. in diam., 8.5 mm. long *to* 10 x 11 mm. in diam., 13 mm. long. The greater proportion of the seeds was in the larger size range.

According to Hannibal in a recent communication (9-6-57), No. 2 is "typical of the variants growing near Stellenbosch. It resembles Marloth's plant (Flora So. Afr. 4: p. 125), although the color is slightly more variable . . . as you may recall our *Brunsvigia rosea major* which grows so well in California and England is not typical of the average Cape species. Most of the Cape variations haven't the vigor, stature, color or number of flowers. And most of them refused to flower for me for years . . . Wouldn't be surprised if the original Blanda type came from this area."

Hemerocallis x *yeldara* Traub, hybr. nov. Plantae hybridae species complures implicatae, magnitudine staturae variae, floribus magnitudine variis de tempore vernale productis. Holotype: *H.* x *yeldara* cl. 'Apricot'; TRA No. 616; leg. J. S. Cooley, cult. Beltsville, Maryland, 5-20-58.

Hemerocallis x *stoutara* Traub, hybr. nov. Plantae hybridae species complures implicatae, magnitudine staturae variae, floribus magnitudine variis de tempore autumnale productis. Holotype: No. 619 (TRA). *H.* x *stoutara cl.* 'Miss Arcadia'.

Amaryllis x *degraaffara* Traub, *hybr. nov.* Hybridae inter species aliquot obviae (*A. reginae, A. vittata, A. psittacina, A. striata, A. aulica, A. belladonna,* etc.), plantae maximae, flores maximi modice patuli. Hybrids involving several species *(A. reginae, A. vittata, A. psittacina, A. striata, A. aulica, A. belladonna,* etc.), plants very large; flowers very large, moderately open. Holotype: Traub No. 513 (TRA).

Amaryllis x *pearceara* Traub, *hybr. nov.* Hybridae inter species aliquot obviae *(A.* x *degraaffara, A. leopoldii, A. pardina),* plantae maximae, flores maximi patuli. Hybrids involving several hybrids and species *(A.* x *degraaffara, A. leopoldii, A. pardina),* plants very large; flowers very large, wide open. Holotype: Traub No. 514 (TRA).

AMARYLLID GENERA AND SPECIES

HAROLD N. MOLDENKE

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time so that these will be available to the readers.]

Urecolina miniata Benth. & Hook. f., Gen. Pl. 3: 732. 1883.—Differs in having its leaves narrower (broader, however, than we see depicted in the illustration and always petiolate), the perianth vermilion, the lobes short, free, and the filaments more narrowly dilated at the base, with a membrane not uncommonly shortly transversing the tube, not, however, connate into a ring and more or less extended in different flowers. *Stenomesson croceum* Hook., Bot. Mag. pl. 3615, excluding the synonymy is according to W. Herb. similar to this species, *U. miniata,* as far as the imperfect diagnosis indicates. This species is closely related to all its congeners known to us and to *Stenomesson,* differing in the basal membrane of the filaments being obscure and not connate into a perfect cup. *Leperiza eucrosioides* Baker appears to be referable to *Phaedranassa.*

Urecolina pendula Herb. (l. c)—Perianth lemon-yellow, the limb rather broadly urceolate, becoming greenish at the apex, the basal membranes of the filaments very thin, perfectly or imperfectly connected in a tranverse line. In *U. latifolia* the perianth is wholly like that in *U. pendula,* but is somewhat narrower and the transverse line between the filaments (according to the illustration) is more conspicuous, but we have not seen any actual specimens.

Eustephia argentina Pax, Bot. Jahrb. 11: 328. 1890.—Leaves linear, obtuse; scape tall; exterior involucral bracts 2, rose, lanceolate, the interior ones membranous, pale, much smaller, setaceous; inflorescense many-flowered, pseudo-umbellate, the flowers unequally long-pedicellate, nodding, subsecund; flowers developing with the leaves, tubular-funnelform; perigonium scarlet, the tube very short, the segments oblong-obovate, the 3 exterior ones acute, the 3 interior ones very obtuse, slightly emarginate, apiculate; stamens slightly surpassing the perigonium; filaments attached to the segments of the perigonium, only slightly connate at the very base, dilated to 2/3 their length, one-dentate above the middle on both sides, the tooth obtuse; anthers versatile; ovary triangular; style filiform, subequaling the stamens; stigma 3-lobed; capsule triquetrous; immature seeds with a black shiny testa. Bulb not known; leaves 20—30 cm. long, 5—6 mm. wide, apparently subglaucescent; scape to 20 cm. tall; involucral bracts 6—8 cm. long; flowers 12 or more; pedicels conspicuously unequal, 3—12 cm. long; perigonium to 3 cm. long, 1.5 cm. in diameter, the lobes to 6 mm. wide; style scarcely 3 cm. long.—Argentina; very frequent on the higher spots, Cuesta dela Negrilla y del Durazno, province of Catamarca, collected by Schickendantz in November and December, 1873.

Eustephia marginata Pax (l. c.)—Bulb brown, ovoid, the neck elongated; leaves narrowly linear, coriaceous, narrowly white-margined, glaucous, scabrous-margined; scape tall; involucral bracts all quickly marcescent, pale, the exterior ones longer; inflorescence many-flowered, pseudo-umbellate, the flowers unequally pedicellate, nodding, produced at the same time as the leaves, funnelform; perigonium rose, the tube very short, the exterior segments oblong-obovate, the interior ones narrower than the exterior ones, very obtuse; stamens slightly surpassing the perigonium, the filaments attached to the segments of the perigonium, scarcely connate at the very base, dilated to 2/3 their length, one-dentate on both sides above the middle, the tooth acute; anthers versatile; ovary triangular; style filiform, exserted, surpassing the stamens; stigma capitate, small. The bulb is 4 cm. in diameter; the leaves to 30 cm. or more in length, scarcely 5 mm. wide; the scape almost 12 cm. tall; the involucral bracts 8 cm. long; the flowers not quite a dozen per inflorescence; pedicels 3—6 cm. long; perigonium 3.5 cm. long, 1.5—2 cm. in diameter, the exterior

[MOLDENKE, GENERA & SPECIES—continued on page 26.]

3. GENETICS AND BREEDING

PLANT BREEDING—HOBBY AND PROFESSION

Jack Scavia, *Lakeside, California*

Growing hybrid amaryllis bulbs for the wholesale market offers a real challenge to anyone in this country. Foreign competitors have 10 to 20% of our labor costs; several firms in Holland have generations of bulb breeding behind them, and some have government subsidies as well. Outdoor production is not a great deal of help due to high cost of suitable land. From my meager experience, I feel the only answer is better quality and something different. Outdoor growing produces sturdier growing plants, and the fact that the bulbs do not have to be shipped as far as when imported gives the buyer better quality stock.

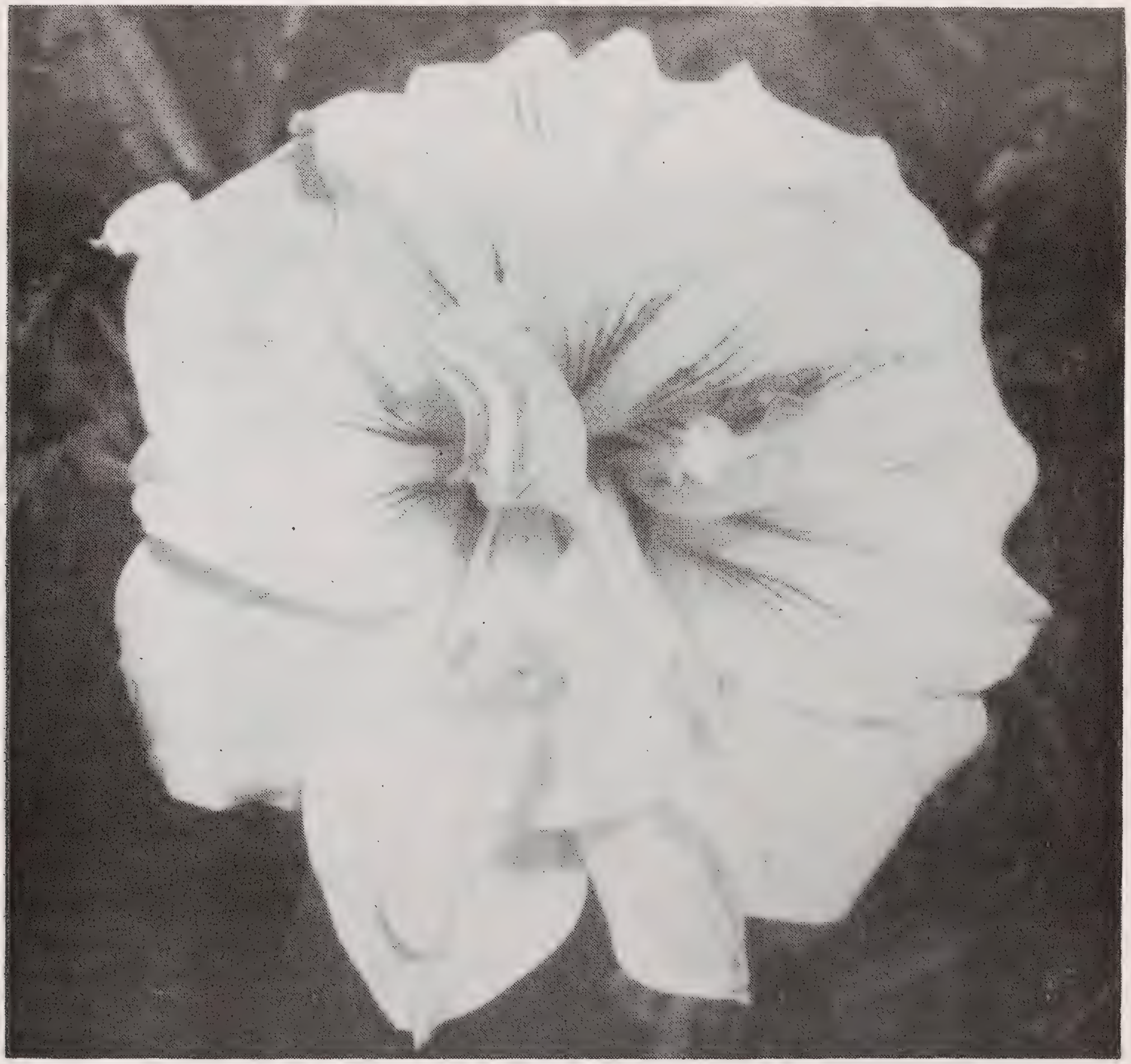


Fig. 11. Double Hybrid *Amaryllis* cl. unnamed. Photo by Jack Scavia.

With the thought of trying for something "different" I started several years ago with some general run amaryllis hybrids, bulbs from several California breeders and five named Dutch clones. Too late I realized I should have kept only the very best; too many times the dominant parent influences the seedling with its qualities; and usually the general run or average bulbs dominate the named clone.

I added a few *Amaryllis* species to my breeding stock. With me the species are very trying; some produce no seeds at all, others make sterile seeds and rarely do I find a seedling worth keeping for breeding.

With my limited experience, colchicine seems to hold out some hope to amaryllis fans. Results are very erratic, many treated bulbs being unaffected, some far below original quality, and a few with very desirable traits. I have grown a number of good miniatures from large-flowered types treated with colchicine. I have noted some mutations with 8, 10, 12 and even 18 tepalsegs. To me it seems the induction of color variants is one of colchicine's best assets—brown, copper and bronze shades turn up now and then. Using a dilution of 0.2% to start, the grower can experiment with this and weaker dilutions of colchicine. Seeds and small offsets may be soaked in the drug 8 to 12 hours. Large bulbs may be injected by the hypodermic procedure.

My most outstanding results to date have been with double hybrid amaryllis. I added some bulbs of the double, 'Helen Hull', to my breeding stock. Seedlings from doubles crossed on singles do not include a high percentage of quality doubles. I have used the pollen from 'Helen Hull', but so far all double seedlings I have bloomed have irregular shaped tepalsegs, standing out from the center of the bloom at various angles. Occasionally I find a mutation in my colchicine treated stock with 8 to 10 tepalsegs, all arranged flat but none is as attractive as the one shown in the illustration (Fig. 11). In this there are three times the usual number of tepalsegs in a flat symmetrical form. This will be propagated for naming and distribution in due course.

EFFECT OF COLCHICINE ON HYBRID AMARYLLIS

Andrew T. Weil, *Pennsylvania*

I first became acquainted with colchicine in January of 1957 when I found a brief mention of it in a biology textbook. My curiosity led me to begin a research project on the drug, and thus I soon understood what colchicine could do to plant cells, how it produced mutations, and how it could be used. Before long, I found myself so interested in plant mutations that I decided to undertake a series of experiments using colchicine to produce them artificially.

My first problem was the selection of the type of plant with which to experiment. Since I wanted quick growth, I decided to choose some bulbous plant. The large flowers of *Amaryllis* hybrids were perfect subjects, for due to their size, mutations in them could be easily detected. For my project I used fifty Giant American Hybrid *Amaryllis* bulbs and two types of colchicine—a one-tenth of one per cent (0.1%) solution, and a four-tenths of one per cent (0.4%) emulsion. All of the experiments were performed on the flowering stems; no attempts were made to affect either the leaves or the bulb itself.

In mid-February the first experiment was conducted. The terminal bud of a bulb's flowering stem (scape) was dipped into colchicine solution as it emerged from the bulb. When the plant bloomed two weeks later there were *no* apparent differences between these blooms and those of untreated control plants. In each case of external solution treatment the flowers opened when the scape was about thirteen inches tall. This was also true of plants in the control group.

Experiment #2: This was performed on several bulbs. One-quarter (¼) ml. of colchicine solution was injected directly into the bud of each bulb as it emerged. Again, the scapes reached thirteen inches before the blossoms opened, but now the flowers were altered. The petepalsegs and setepalsegs of all treated flowers were slightly thickened; and more striking, they were crinkled and had ruffled edges. This crinkling and ruffling was observed *whenever solution was injected directly into the terminal bud of the scape.* However, did the colchicine produce this effect or was the ruffling caused by the injection alone? To rule out the latter possibility, I set up a control experiment in which I injected one-quarter (¼) ml. of distilled water into the buds of two different bulbs. When these control plants bloomed, their flowers had straight, smooth tepalsegs (=petepalsegs and setepalsegs). This meant that the ruffled tepalsegs had been caused by the colchicine solution.

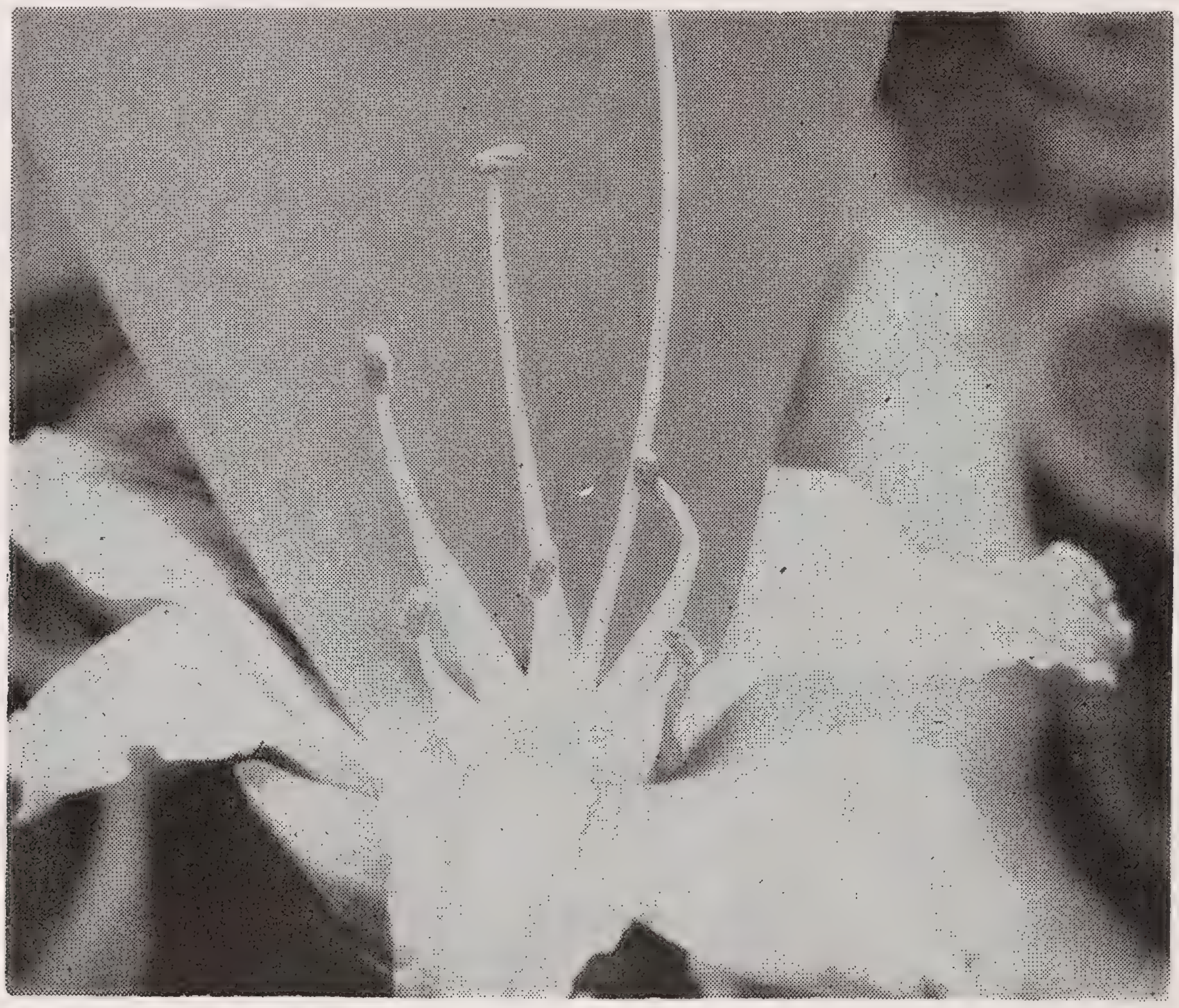


Fig. 12. Colchicine treated hybrid *Amaryllis.* Flower from bulb in Expt. 4, which received injection of 0.4% colchicine emulsion. Note elongated pistil, variation in lengths of stamens, and swelling of stamen bases. Photo by Andrew T. Weil, Phila.

Experiment #3: The buds of several bulbs were dipped into four tenths per cent (0.4%) colchicine emulsion. *In every case,* the flowers (ruffled, as in experiment 2) opened when the flowering stems were only four or five inches tall!

Experiment #4: One-quarter (¼) ml. of 0.4% colchicine emulsion was injected into each bud of several bulbs as they emerged. This again caused the flowers to bloom on a short flowering stem, but also brought about several startling changes. First, the tepalsegs, in addition to being ruffled, were displaced, so that the flowers became monstrosities. Second, the pistils were greatly elongated while the stamens became shortened. In every case, the filaments of the stamens became swollen at their bases (Fig. 12). The anthers contained little or no pollen, and the flowers set seed poorly.

Most of the flowers were artificially self-pollinated and some of the resulting seeds were sent to Prof. Ira S. Nelson in Lafayette, Louisiana, who will examine the seedling root tips to learn whether the mutated flowers bred true. If not, the seeds will produce normal plants and will not pass on their mutations. In any case, I feel my project was both rewarding and successful, and I hope to enlarge and continue it in the future.

NERINE BOWDENII VARIATIONS

L. S. Hannibal, *California*

Nerine bowdenii was found originally by Mr. Cornish Bowden while making a trip up into the mountains back of King Williams Town, Cape Province, in 1903. Since the bulb's introduction several variants have appeared on the market, the most popular in England being 'Fenwick' which was grown by Mark Fenwick at Stow-in-the-World, Gloucestershire.

In contrast, here on the Pacific Coast we have the variant *N. bowdenii* var. *magnifica* which has been released during the last few years from the garden of the late E. O. Orpet in Santa Barbara. Variety *magnifica* is a beautiful plant, being much larger in stature and blossom than the original type species. It is the writers understanding that var. *magnifica* was a Richard Diener production. Diener was an active Amaryllis breeder who had a specialized nursery in Oxnard some 20 years ago, and a number of nice things came from his garden including the Diener hybrid Amaryllis.

Variety *magnifica* is probably a polyploid, but whether a hybrid or not may be debatable. The foliage and growth habits differ appreciably from the type species, and the plant is completely sterile. Thus unfortunately, little can be done with it horticulturally.

Apparently there is another large clone of *N. bowdenii* known as forma *gigantea* which was once grown by Herbert Chapman and at the Dublin Botanical Garden by Sir Frederic Moore. At present little is known regarding this latter clone.

Nerine bowdenii is notorious for producing parthenogenetic seeds. The late Major Pam discussed this in the Journal of the Royal Horticultural Society, page 128, March 1955. The writer has just about given up trying to use the plant as a breeder due to the same trouble. A thorough emasculation of the blossoms is of no aid. Seeds still develop in copious amounts. Where those crosses with *N. bowdenii* have been effected it has been with *N. bowdenii* pollen.

Out of the usual seed production from *Nerine bowdenii* about 50% show chlorophyll deficiencies, and amongst all seed the degree of pigmentation varies widely. The viability of the seed also varies greatly, some sprouting quite rapidly and others taking months. The same applies to foliage development. In spite of considerable care, and germination on moist vermiculite, mortality is usually quite high and it has only been until recently that the writer could avoid losses in excess of 50% during the first year. The bulk of the loss is with the seed that germinate poorly or have little inclination to produce roots. Since this difficulty occurs in several strains of *N. bowdenii* it cannot be attributed to the eccentric behavior of one specific clone which in itself could carry abnormal chromosome patterns.

Parthenogenetic seeding habits are not uncommon amongst many of the *Amaryllids,* and particularly in *Nerine* and *Brunsvigia rosea* (Cape Belladonna), and its forms. However the chromosome instability of *N. bowdenii* is particularly unique and justifies further investigation. This behavior probably accounts for the several strains in the trade, and others, including a white or two which are in collections in England.

TWO FERTILE CLONES OF **LYCORIS RADIATA**

WILLIAM LANIER HUNT, *North Carolina*

For years, I kept getting letters from Louisiana and the Lower South in summer mentioning that red spider-lilies were in bloom. This seems to have started in 1931. Then some one sent me some bulbs. They bloomed in late July! Later on, in a batch of bulbs to be identified, came more lycorises. They bloomed about two weeks later. Both of these clones produced seeds every year, and I began to get pollen from everything in sight and fertilize them. The results were the usual parthenocarpic creatures which all looked like the seed parent.

These clones offer us a great opportunity for creating some new lycorises. Whether or not my clones are the same ones mentioned by Mr. Sam Caldwell will have to be determined in order to see what we have here in breeding material. The lengthening of the flowering season for *Lycoris radiata* is a welcome feature of the fertile clones if they do no more for us. The two fertile clones lead off the season in July and August, and the old sterile one flowers in September. With the several new species overlapping these flowering times, the lycoris season comes to be a real event in late summer and early fall, for the other species fill in the gaps and overlap all these to make a nearly continuous flowering period from *L. squamigera* to *L. aurea.*

HYBRIDIZING LYCORIS

SAM CALDWELL, *Tennessee*

The cross breeding of lycoris species is an activity you can still "get into on the ground floor." Very little of it has been done. This is true probably because the only two species grown very widely in this country —*L. squamigera* and *L. radiata*—are represented in gardens by infertile forms, and no seed can be obtained.

I've heard of a few hybrids. Mr. William T. Wood, of Macon, Ga., in 1941 used *L. radiata* pollen on *L. traubii* blooms, and got seeds which eventually produced the hybrid *L. woodii.* I understand that the flowers are yellow, resembling those of the seed parent.

In 1950, Mr. B. Y. Morrison, then living in the metropolitan Washington, D. C. area, had in his garden the somewhat rare seed-bearing form of *L. radiata.* Dr. John Creech pollinated some of its flowers with pollen from a yellow-flowered *Lycoris* labeled "L. aurea". [This species at the USDA Plant Introduction Garden, Glenn Dale, Md., has been named *L. chinensis* Traub in the present issue of HERBERTIA, and is not the *L. aurea* grown around St. Augustine, Fla.] Mr. Morrison delivered the seeds to Dr. Creech who grew the seedlings. One of the resulting hybrid seedlings has bloomed; the flowers are "yellow with longitudinal reddish stripes," according to Dr. Creech.

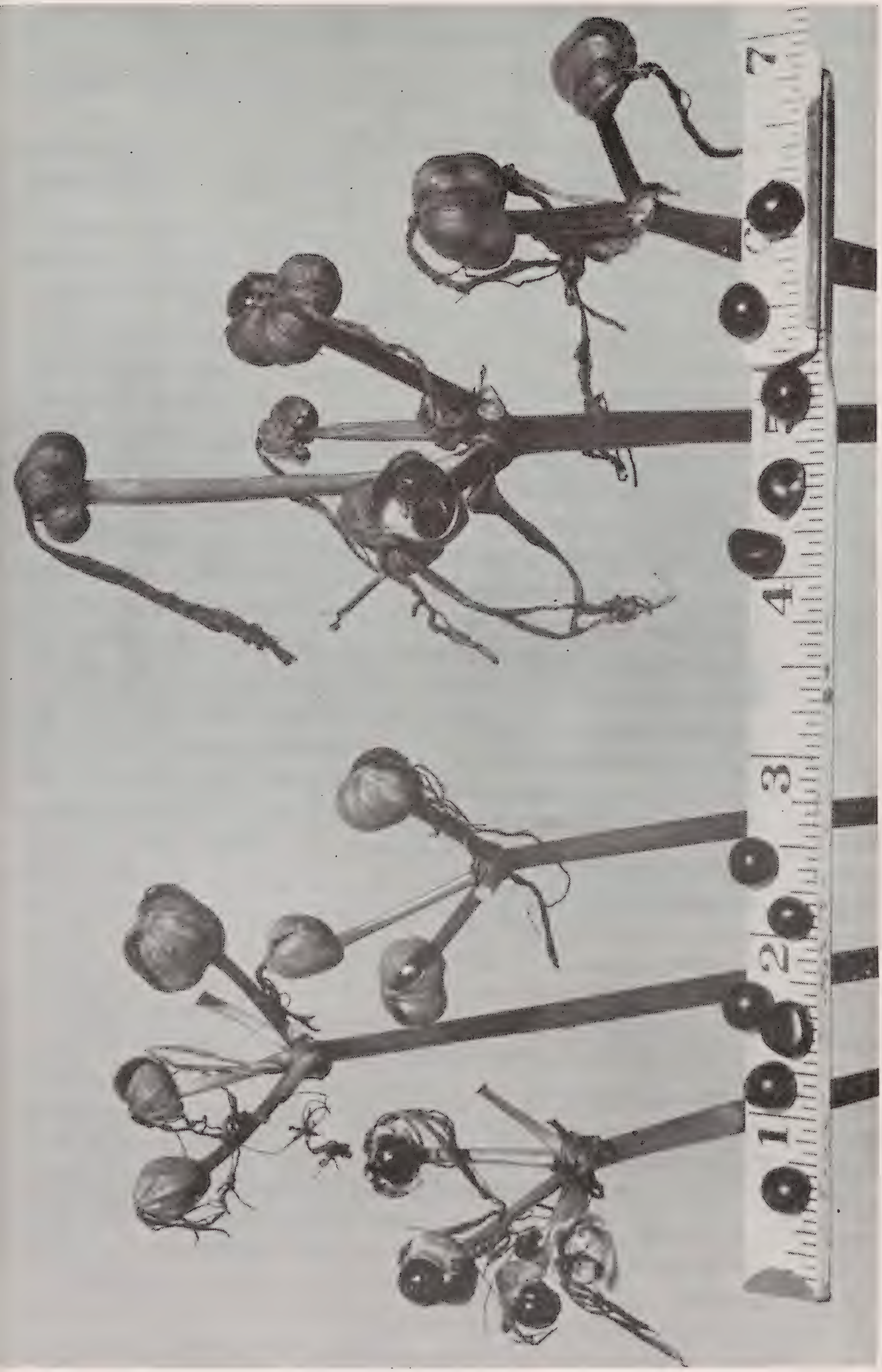
In 1956 Dr. Hamilton Traub successfully made a *L. aurea* x *L. traubii* ♂ cross, at La Jolla, Calif., and in 1957 he succeeded with the reverse, *L. traubii* ♀ x *L.* ♂ *aurea.* In fact, he sent me seeds of each; they have germinated and are growing.

I am a bit presumptuous to write this piece, because all there is to show for my own hybridizing efforts are dozens of pots full of seedling bulbs, from one to five years old—no flowers as yet. However, even the leaves of some of the seedlings have a "different" appearance, so I have high hopes. These notes are to encourage others to get started in what may turn out to be a fascinating horticultural activity.

First you must have established flowering bulbs of some kinds of fertile lycoris—the more the better—to serve as seed parents. I have the following to work with now, listed in order of their season of bloom: (1) *L. sanguinea,* (2) *L. haywardii,* (3) *L. radiata* (fertile type—not common garden form), and (4) *L. sprengeri.*

These four set seed freely every year in my plantings. I also have *L. aurea* and *L. traubii,* which seed in Florida, but under pot culture with me they have never matured sound seed. Only recently I have added an unidentified hardy, fertile, golden-flowered lycoris, which should be useful in future hybridizing.

In addition, I have the following which are sterile, or, at least, have never borne seed in my garden: (1), *L. squamigera,* (2) *L. incarnata,* (3) *L. houdyshelii,* (4) *L. caldwellii,* (5) *L. radiata* (sterile), (6) *L. albiflora* (probably true stock; never bloomed after first year. Evidently too tender for outdoor cultivation here), and (7) *Lycoris elsiae,* (A fine near-white, tinted salmon and pinkish; received under various



Lycoris fruits and seeds. *Left, Lycoris radiata* (fertile form); right,, *Lycoris sprengeri.*

Plate 3

names—"*L. alba,*" "*L. radiata alba,*" "*L. radiata carnea,*" and "*L. albiflora carnea.*")

Though these never set seed, I continue to use their pollen on some of the fertile species, in the hope of getting "takes."

My breeding techniques are very simple. Because all the seed-bearing lycoris seem highly fertile to their own pollen, the first precaution in hybridizing is to see that the plants you are working with are not allowed to self-pollinate. I work with little groups of bulbs, isolated by 100 feet or more from others of their own kind. Each day as the flowering season starts I go over the clumps carefully, pry open each bud which has nearly reached the opening stage and remove all the anthers before they have a chance to "unfold" and release their pollen.

At the same time I work over each umbel with a ripe anther from the desired male parent, rubbing pollen onto the stigma of every open flower. I've never been quite sure when the stigma is most receptive (on newly opened flowers, I suspect), so to play safe, I repeat the operation for three days. Scapes are labeled with records of the crosses made. Then it is only a matter of waiting for seed to mature—until October with most species.

Seeds are large (often ¼ inch or more in diameter), shiny and black when ripe (Plate 3). I gather them as soon as the capsules start splitting and plant them immediately. They shrivel badly if allowed to dry very long. I do not know but suspect that excessive drying affects adversely their viability.

There are undoubtedly several satisfactory ways to handle the seed. It has been my practice to plant them about an inch deep in pots of a sand-soil-leafmold mixture, kept in a cold greenhouse over winter, with the soil moist. In a warm location lycoris seed start germinating within a few weeks, but under my cold greenhouse method of handling they simply lie in the soil through the winter. As the soil warms in March and April, they germinate. Even then, there is nothing above ground to show you what is going on. But down in the soil, nearly every seed develops into a slender bulblet shaped like a tear-drop.

Leaves, like coarse grass blades, spring up the next fall, about a year after seeds have been planted. One odd characteristic is that both selfed and hybrid seedlings from *L. sprengeri* make fall growth, although mature flowering size bulbs of this very hardy species do not produce their leaves until spring.

My seedlings are agonizingly slow in getting up to blooming size. In fact, none have reached it yet, in five years. Probably the fact that I keep them in pots—and too crowded in some cases—has slowed them down. I plan to build a special "nursery bed" outdoors, but with protection, for them next year. Meanwhile they look healthy, are adding a little size each year, and give me much to look forward to whenever they do start blooming.

Thus far I've tried crosses only when overlapping bloom periods of

[CALDWELL, LYCORIS HYBRIDIZING—continued on page 107.]

4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

GROWING AMARYLLIDS IN NORTH FLORIDA

BECKWITH D. SMITH, *Jacksonville, Florida*

My interest in Amaryllids was stimulated by my mother, who grew them extensively in Marianna, Florida, which is located in the northwestern part of the state, just under the Alabama line. She loved zephyranthes, lycoris, sprekelias and many of the crinums familiar in that area. Observing her success, I determined to do likewise, and obtained my 'start' in bulbs from her.

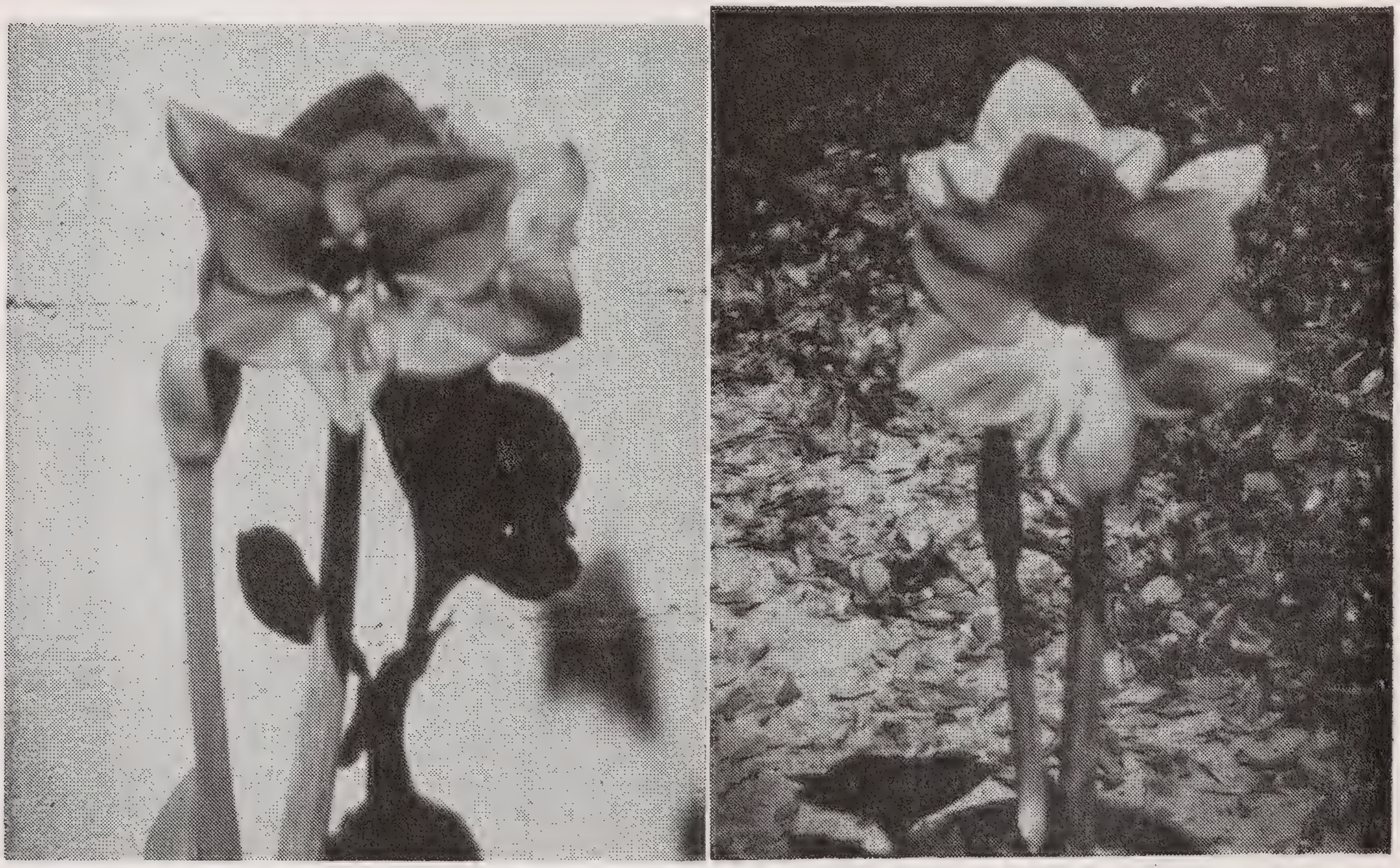


Fig. 13. Hybrid *Amaryllis* clones, *right,* 'Mary Lou' *left,* 'Red Duval'. Originated by Beckwith D. Smith.

Not being satisfied with a few bulbs, I was eager to secure an increase for a better display of flowers, but the only way available to me at that time was to grow them from seed, which was very slow. However, I did grow them on and in the end obtained many good bulbs. The bulbs I have grown in the Jacksonville area include *Lycoris aurea* and *L. radiata* (I cannot bloom *L. squamigera); Sprekelia formosissima; Hymenocallis narcissiflora, Haemanthus multiflorus; Gloriosa rothschildiana, G. superba, Clivia miniata,* Mead *Amaryllis,* and, for the last seven or eight years the better forms of well known Dutch clones of *Amaryllis,* principally the Ludwig strain, and also crosses between these and a few of Van Meeuwen and Warmenhoven strains. I suppose my experience in growing Amaryllids will cover a period of better than fifteen years. Fertilizing for a number of years was more or less haphazard, and my bulbs were grown in the sandy loam which is prevalent around the city.

After having grown and crossed the Mead strain *Amaryllis* for a number of years without much success in obtaining desirable flowers, I was considerably discouraged until a flower shop displayed some blooming plants of Dutch hybrids. My delight and astonishment at these beautiful flowers was so great that I immediately dumped the bulk of my Mead stock, and thereafter began purchasing Dutch bulbs exclusively. In a few years the results of cross pollination were startling, as well as were the self colors which I was able to obtain, and at this time I have

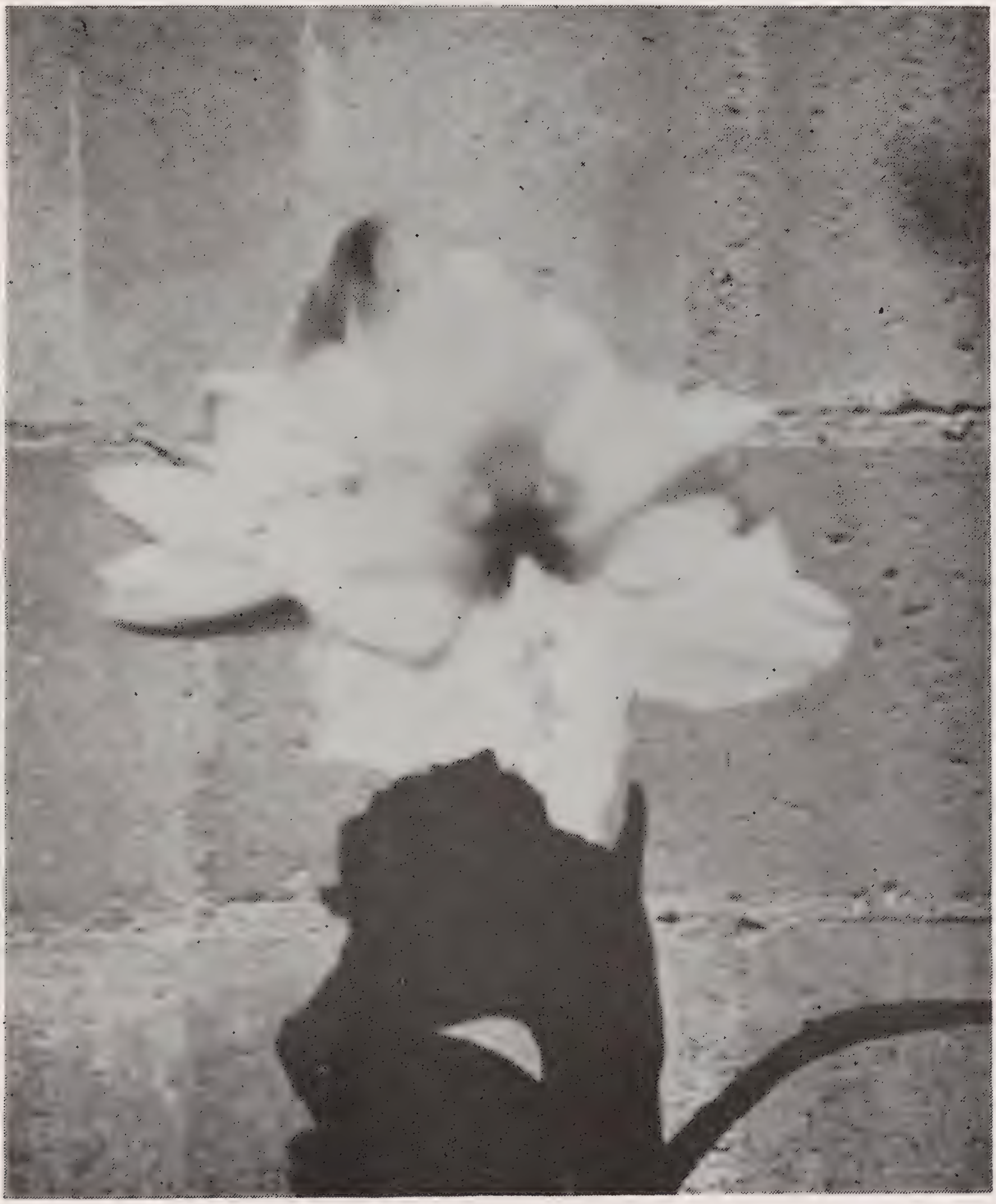


Fig. 14. Hybrid *Amaryllis* cl. 'Irma'. Originated by Beckwith D. Smith.

many bulbs which produce solid colors of beautiful flowers including many hues of red, rose, pink, orange, and white.

After starting with the Dutch bulbs the old hit or miss method of fertilizing was abandoned. I grow all my bulbs in raised beds, in which is incorporated a rich mixture of peat, rotted leaves, sheep manure and bone meal. Top dressing is given from time to time of additional well rotted cow manure, and occasionally a spray is applied of soluble fertilizer. Also, organic limestone is dusted on the beds at least once during each growing season. The bulbs make a spring growth, during which they fill out rapidly, and during the fall months of September and October they also put on a growth spurt. Bulbs which do not go dormant from natural inclination thereafter are forced into dormancy by the first killing frost in early winter. Growth is actively resumed in March.

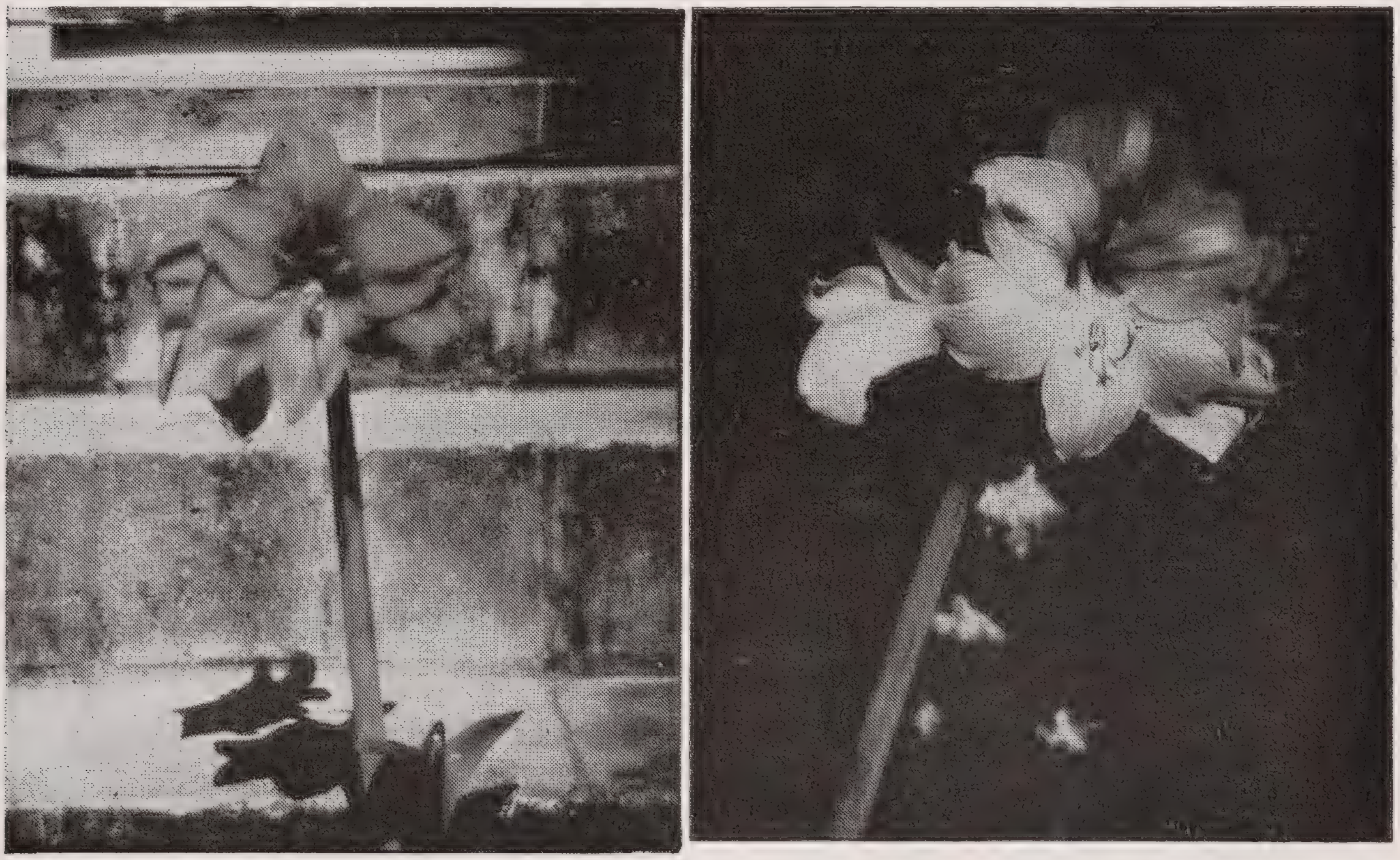


Fig. 15. Hybrid *Amaryllis* clones, *right,* 'Ruth Clark'; *left,* unnamed seedling. Originated by Beckwith D. Smith.

During this year (1957) the Dutch hybrids grown and collected by John T. Weisner of Fernandina Beach, and about which he has given progress reports in prior issues of HERBERTIA, were acquired by purchase and these will be used in further breeding efforts in my growing beds. An effort will be made to further propagate these named clones and seedlings with a small stock of Bolivian Amaryllis which were presented to me by Mrs. U. B. Evans, of Ferriday, Louisiana, a most charming lady and ardent disciple of *Amaryllis* culture, when I visited her this summer.

Some of my better Dutch hybrids are "Mary Lou" (Fig. 13), named for my wife, which is a rose pink clone from a cross between 'Pink Perfection' (Ludwig) and 'Doris Lillian' (Ludwig); "Irma", named for my mother, (Fig. 14), which is a white clone with yellow throat, a cross between 'Ludwig's Dazzler' (Ludwig) and 'Maria Goretti' (Ludwig); ''Duval Red'' (Fig. 13) which was produced from pollen from 'Queen Superiora' (Van Meeuwen) on 'Lucifer' (Van Meeuwen); 'Ruth M. Clark' (Fig. 15), (named for a friend in Tampa, who has had notable success with hybrid *Amaryllis)*, which was produced from pollen from 'Red Master' (Warmenhoven) on a field run Mead seedling. I call this cross a red and white, and, finally, an un-named orange hybrid (Fig. 15) obtained from a cross between 'Diamond' (Ludwig) and 'Salmon Joy' (Ludwig). Many seedlings are large enough to bloom next spring, and the better types will be segregated. To my way of thinking, the Dutch *Amaryllis* are the best so far obtainable, and there are still many possibilities for breeders to develop even finer flowers from the almost inexhaustible generic complex they afford.

MORE OF MY AMARYLLIDS

REG. F. HARRADINE, *Corresponding Fellow APLS*
102 Byng Drive, Potters Bar, England

In Herbertia, 1956, I described the Amaryllids and related plants garnered since I first started collecting them in 1950. That article brought me many letters—from North and South America, South Africa, Europe, India and New Zealand. Unfortunately, the name of my home town—Potters Bar—was omitted from my address given in HERBERTIA but as so many letters succeeded in reaching me, I am hoping none went astray. These letters were most friendly and encouraging.

I find I mentioned the names of nearly a hundred plants. As now, June 1957, my collection contains more than 220 named and unnamed species and/or varieties, I thought, maybe, you would like to hear more about my Amaryllids.

AMARYLLIS. The bulbs from British Guiana which I thought were *A. stylosa* have proved to be *A. belladonna major*. This grows well with me and regularly, in the Spring, each bulb gives two stems, with two flowers per stem. They are charming, so delicate in colour, shape and poise. I have another variety of *A. belladonna* from San Ignacio, Bolivia, the leaves of which grow more horizontally. The flowers are somewhat smaller than var. *major,* but are identical in details. The colour of these two varieties is rather difficult to describe, being neither red, nor pink, nor orange—an intermediate colouring—R H S 13/2 is as near as I can get to it.

Adrian Thompson, from British Guiana, visiting me a few weeks ago, brought for me, two bulbs of *Amaryllis barbata,* collected from Surinam. These have since flowered, and very beautiful they were. Large creamy white, with pale green throat. Typical wavy tepalsegs. I am fortunate in having such a lovely thing added to my collection. By a lucky chance, the Bolivian variety flowered at the same time and I was able to cross pollinate both of them. Pods are now well developed promising a good crop of seeds. I have several bulbs of the smaller type species, have had them four years, but cannot persuade them to flower. Bulbs of *Amaryllis belladonna* var. *plena* have recently reached me from India.

Amaryllis blumenavia, from Mr. Mulford B. Foster, has been slow but is now growing well. From British Guiana I have bulbs of three varieties of *A. elegans*—pure white, almond scented—white with faint pink stripes—greenish white with pink stripes, also scented. In addition, seedlings of the variety *ambigua.* None of these have given flowers. Indeed, it has been a struggle to get them to survive, but they are now growing healthily. I hope eventually to see their lovely blooms. For a novice like me, trying to give these delicate things conditions similar to those of their native habitat leads to much head scratching! *Amaryllis immaculata* is another far from easy member. My bulb is a fine one and is healthily solid. Dormant at the moment, I am waiting for it to show signs of growth, and this time I hope it will be a bud.

Amaryllis correiensis (organensis) and *A. reginae* are growing well, but have not flowered. *A. reticulata* (plain leaves) has just reached me from India, together with *A. reticulata* var. *striatifolia* hybrid clone 'Mrs. Garfield.' *A. striata* var. *fulgida* is a fine plant, much more sturdy than the type. Flowers are somewhat similar, especially in colour, to those of the Bolivian *A. belladonna* previously mentioned. Four flowers in the umbel. Quite a lovely, delicate thing. For your records, I should mention that I have received direct from Argentina, a large parcel of bulbs of the type species, *A. striata,* which were collected from Entre Rios, Argentina. This place, I make to be about 150 miles east of La Paz, on the border of Uruguay.

My remaining *Amaryllis* species are all unidentified. Two from British Guiana, one of which is having a rare struggle to keep alive, the other has developed into a fine plant and has flowered twice. After the habit of *A. johnsonii,* but differs in many small details. Have very intriguing bulbs from Bolivia, (San Ignacio). They seem to be naturally deciduous, yet one is in full growth and the other dry resting. Medium sized, globular bulb, with hardly any neck, light brown tunics over bright green inner skin. Two strong, thick, leathery grey green leaves, strongly keeled, more or less parallel sided, about ¾ inch in width, reaching 12 inches in length, bluntly pointed. Leaves grow very vertical. On the back, the keel is coloured maroon for half its length. Each bulb has had two growing cycles, but neither has produced more than two leaves per cycle. I am most anxious to see this one flower. Can it be *A. viridiflora?* [Editor's note: it may be *Amaryllis cybister.*]

A bulb labeled *A. tucumana* flowered and proved itself to be anything but what the label said! More like the San Ignacio *A. belladonna,* but petals more regular and not waved. I could detect no paraperigone, but I may be wrong about this, for remember, I am very much a novice. For the time being I have put it amongst the unidentified. It is probably a species collected from the Tucumana district.

Seeds taken from a herbarium specimen collected from Arampampa, Bolivia, germinated and I have potted up 14 fine little bulbs, which are just beginning to sprout leaves. From a dried flower sent with the seeds, I imagine this to be another Bolivian *A. belladonna.*

Other unknowns are bulbs from Bolivia, collected from Puente Villa, Inquisivi, Chojlla, Sucre and Iquico. Not sufficiently developed to warrant description yet. Photographs of the flowers of some of them show rare loveliness. I rather think the species from Iquico will prove to be the new *Chlidanthus* of which Dr. Traub already has knowledge. [See 1957 HERBERTIA, pages 70-73.]

Lastely, arriving only a few weeks ago, bulbs of a species of *Amaryllis* from La Convension, Peru. Have just had a letter advising despatch of a parcel from Peru containing . . . "Hippeastrum [=*Amaryllis*] sp., pink blossom, very nice, and from a new place, far away from Cuzco, from the jungle; . . . perhaps a new species." What tremendous fun and excitement there is in this collecting of rare and elusive Amaryllids!

Now for the other genera. Visiting this year's Chelsea Show, Mr. Th. Hoog of van Tubergen, found time to visit me and we had a delectable evening together. Amongst other things which I hope to receive from him in due course, will be Brunsdonna tubergenii and *Hymenocallis quitoensis* (syn. *Leptochiton quitoensis).*

Brunsvigia natalensis has really got going this year and the foliage indicates a very healthy bulb. From Australia, earlier this year, I received several varieties of the Cape Belladonna hybrids, *Brunsvigia rosea—variabilis, multiflora, intermedia, perfecta, purpurea* and *spectabilis,* also the famous clone 'Hathor'. With these came also *Pancratium fragrans.* Having also received *P. canariense* and *P. zeylanicum,* I now have five species of this genus. I have yet to see any of them bloom.

A bulb sent to me as *Crinum zeylanicum* has turned out to be *Boophone,* and I feel sure it is the very rare *B. ciliaris.* I already have *disticha.*

Many Crinums have reached me. They are all growing well and many of them are sure to flower this year. Some buds are already showing. For the present I will just mention their specific names—*amoenum, bulbispermum* var. *sanguinum, graminicolum, johnstonii, latifolium, laurentii, powellii album,* and *P. harlemense,* and *rattrayii.* My collection of Crinums now numbers 22 species and varieties.

The only addition to *Cyrtanthus* has been the *obliquus,* which though it has grown well, has not yet flowered.

Eucharis fosteri, Eurycles sylvestris, Eustephia cocinea, E. "jujuyensis" and *Griffinia hyacinthina* are all in growth. *Hymenocallis macrostephana, H. rotata, H. senegambica, H. harrisiana* are all, most probably, well known in the States. One which is, perhaps, not quite so well known, sent from India, is *H. (Ismene) concinna.* The leaves and manner of growth are very similar to *H. harrisiana.* These *Hymenocallis* do well in my warm house and I get flowers from most of them. The hybrid 'Sulphur Queen' is a beautiful flower and has a very strong fragrance. *H. amancaes* also, is beautiful and fragrant. All appeal to me very much, they are so exquisitely and gracefully beautiful. I now have 15 species and varieties.

Hyline gardneriana has arrived recently from India. *Hypoxis villosa,* a close relation of the Amaryllids, from Southern Rhodesia, is interesting, but not startling. Long, slender, rough textured leaves, growing stiffly vertically. The flowers, on thin wiry stems, held rather fugitively within the leaves. Deep buttercup yellow, about one inch across, similar to the small ornithogalum, but without the centre cone. Each flower lasts about a day or so.

Additions to *Lycoris* species are *albiflora* and its variety ''*carnea,*'' *sanguineus* and *sprengeri*—all from van Tubergen. All the *Lycoris* have lost their foliage and soon it will be time for the flowers—if they intend being so kind! I find them rather shy, or do I expect these things to settle down too quickly?

My Nerines now add up to 26 by the addition of the species—*Nerine fothergillii, falcata, laticoma (lucida),* and *salmonea* and the hybrids 'Aurora' and 'Hera.' Last season was very disappointing, very few flowered. We had very little sun during the preceding summer, so little in fact, that I did not need, even for one day, to put up any form of shading. Sunbaking seems essential to Nerines for any hopes of flowers. However, this year they are already losing their foliage and the bulbs look fat and well. We are getting plenty of sun, and I hope this season to have a bumper show. *Nerine salmonea* is a very fine, brilliant, deep pink. Came from Australia.

Now some real rarities. *Lepidopharynx deflexum,* from Bolivia. I know nothing about this other than what appears in the book by Drs. Traub and Moldenke—''Amaryllidaceae''. I do not think it has been mentioned in any of the HERBERTIAS. I gather it is an ancient plant and rare. I doubt if it is in any collection outside America. I have six good bulbs, all dormant at the moment. *Worsleya rayneri.* Who, amongst Amaryllid devotees, has not longed to possess the ''Blue Amaryllis''? I never thought to get it, but a friend from Rio de Janeiro, home on vacation last year, promised to get it for me if at all possible and was as good as his word. Two very fine specimens, sent by air, reached me about ten days after being dug. Consequently they have suffered very little check and are growing already. Having read all that has been written about this plant makes me wonder if I shall succeed in keeping it, let alone bring into flower. We shall see—I have many difficult bulbs—they are still there, and growing!

Strong, healthy looking leaves suggest that my bulbs of *Phaedranassa carmioli* and *P. chloracra* are quite happy. I know little about them so cannot forecast regarding flowers.

Another group of plants about which I know very little is the *Stenomesson.* As they are mostly found in rocky places on high ground, I assume drainage to be most important. Also, as the rocks are mostly of limestone, that they need a neutral or calcareous soil. As to their habits, the plants will give this information. All my bulbs, so far, have come from Peru. I have the species *croceum, humile, variegatum* (pink), *variegatum* (cream), *pearcei* and a species ex Cuzco. This latter is showing leaves very similar to *Urceolina,* rather different to the others. I also have *Pseudostenomesson morrisonii* Vargas.

Of *Zephyranthes* I now have 22 species etc. Many are just seedlings. Received as bulbs are—*braziliensis, sulphurea, smallii, traubii,* sp. ex Cuzco and sp. ex Lima. This latter is remarkable in that the leaves are like those of a small *Phaedranassa.* As seedlings I have—*brazosensis, clintiae, concolor, erubescens, pulchella, longifolia* and unidentified species ex Taft (Texas), ex Panama, ex Santa Cruz (Bolivia), and ex Commarapa (Bolivia).

To bring this long list to a conclusion I have only to mention three of the genus Tecopileae—*cyanocrocus,* and varieties *leichtlini* and *violacea.* This is the CHILEAN CROCUS, noted, I believe for its lovely colour. Not an Amaryllid, but a close relative.

Nearly seven years since Amaryllis first cast her spell! It seems but half that time. I have read a great deal, especially since I became the happy possessor of all the volumes of HERBERTIA, and although I have succeeded in collecting so many of these rare and lovely things, I feel I have only made a beginning, such a large number yet remain to be found. Again, very few of my plants have flowered. When they have become properly established and give flowers with some sort of regularity, imagine the opportunities there will be for hybridising. I have already made a start with *Amaryllis forgetii* X *A. reticulata striatifolia; A. belladonna* (San Ignacio) X *A. forgetii; A.* hyb. 'Rose Queen' X *A.* sp (British Guiana); *A. belladonna* (San Ignacia) X *A. barbata* and the reverse cross. The first cross, in particular, from the foliage, looks most interesting. Characteristics of the two species have definitely been exchanged—it is reasonable to assume that the flowers also will show a similar transference of character. They have reached 3 inch pots.

When I built my first greenhouse, my ambition did not go much further than pelargonums and fuschias, etc. I little thought it would lead to the housing of so much treasure. I would again like to take the opportunity of emphasising that, but for the great good-heartedness of my many horticultural friends, I would have had nothing to write about. Bless them, they are wonderful.

In conclusion, may I make a request? If any of those who read these notes of mine, have information which I obviously lack, and which would be so valuable to me in growing these plants, I should be most grateful if they would write to me.

COLD SUSCEPTIBILITY OF AMARYLLIS

WYNDHAM HAYWARD, *Florida*

At least four species and varieties of *Amaryllis* show a distressing sensitivity to cold in Central Florida. Among these are *Amaryllis Albertii,* the double form found in the West Indies, *Amaryllis belladonna* Linn. (Syn.—*Hippeastrum equestre)* native from the West Indies and Mexico to Bolivia and Chile, *Amaryllis striata* and *Amaryllis reticulata* var. *striatofolia* and its named form, 'Mrs. Garfield.'

Mr. Claude W. Davis of the University Hills Nursery, Baton Rouge, La., writes under date of 9/5/55 to inquire why his *Amaryllis belladonna* Linn. bulbs obtained from a plantation in the delta country south of New Orleans, refuse to bloom well in the garden at Baton Rouge some distance farther North in the state. The likelihood is that the answer is to be found in more severe cold weather experienced at Baton Rouge in winter than south in the Delta country.

In Central Florida, in a climate only slightly warmer than prevails at Baton Rouge, *Amaryllis belladonna* Linn., a common garden bulb, will bloom widely after a few warm seasons. After several cold winters, when the temperatures go down into the 20's, the bulbs are injured or shocked and give only sporadic blooms. They are quite tropical and suffer systematically, it appears when frosted. In plantings at Lakemont Gardens in recent years, two long lines of *Amaryllis belladonna* Linn, (the common orange-red form identified as variety "Major" in all probability) were cut down by frosts, the foliage frozen to the ground on several occasions. In the spring after such freezing, the bulbs, an inch or so under the soil, were found rotted at the top in many instances. The recovery was usually satisfactory the next summer growing season, but a succession of frosts in succeeding winters has decimated the two rows of some hundreds of bulbs until they are almost gone.

All this time the thermometer seldom went below 30, and never below 25 degrees. Mr. Davis reports that the winter temperatures at Baton Rouge do not often go below 25 degrees F., and that they have "a light freeze or two each winter, but the temperature seldom goes below 25 degrees and that is not for long." He says the bulbs were reported to have been free blooming at their original plantation home south of New Orleans.

Amaryllis belladonna Linn., seems to take kindly to the sandy soils of Central Florida. In fact the bulbs grow better and larger without special fertilizing and mulching, etc. Fine stands of the bulbs are occasionally found in rows on old country places in warm locations, where the bulbs have multiplied famously. If grown in too rich soils, moist and with too abundant fertilizing the bulbs of this species tend to multiply excessively, forming so many offsets that the parent bulbs are crowded to reduced size. Besides the temperature factor, of course there is the matter of the growing medium and other cultural requirements of all of these bulbs. Other things being equal and satisfactory, the temperature factor seems to be the most important.

Amaryllis reticulata and its striped-leaved form, variety *striatifolia*, were collected in South America in recent years by Mulford B. Foster. He reports both the green-leaved form and the striped-leaved variety, a handsome plant in good condition, grow famously with little care in his greenhouses at Orlando, Fla., whereas the author has had difficulty growing the 'Mrs. Garfield' form of *A. reticulata* var. *striatifolia* in flats and pots outside under trees or in the lath house where the bulbs get temperatures as low as 30 degrees. This kind of cold weather does not injure such hardy types as *Amaryllis* x *johnsonii* and *Amaryllis acramanii*, as reported elsewhere.

Amaryllis albertii has been imported into Central Florida gardens many times, but the writer has always experienced failure with it unless grown in a protected place. In beds in the lath house or in the open garden, the bulbs grow well all summer, but at the first frost, maybe 30 degrees in winter, the foliage goes down and the bulbs show damage to the tissues on the upper or top side in a few days or weeks after the cold spell has passed. The tissue turns brown and dark, even though the bulbs are planted two inches deep in the ground, apparently shocked by the cold temperatures.

This behavior is found in other super-tropical plants as *Alpinia purpurea,* the ''Red Ginger'' of Hawaii, when grown in Florida. The plants of ''Red Ginger'' when grown in Florida will make a foot of growth or more the first summer from roots shipped from Hawaiian nurseries, and then die down and rot away the first time they are frosted by weather below freezing, even a mere degree or two (30 or 31 degrees F.). Many times they fail to come back at all the second season, the roots having rotted away completely in the winter following the frost. This species comes from warmer areas of the East Indies, and is ultra-tropical, not being able to withstand the slightest frost or freezing temperatures in the garden. Presumably in a heated greenhouse they could be brought through without difficulty. Other species of *Alpinia,* as *A. speciosa* (''Shell Ginger'',) can stand several degrees of frost and are seldom damaged in Central Florida. *A. speciosa* comes from the higher altitudes of northern India.

Amaryllis striata Lamarck *(syn.—Amaryllis rutila)* is found as a pot plant in Florida and other states. Many times the bulbs have been handed down so-to-speak from generation to generation as pot plant heirlooms. The author knows of a family where bulbs of *A. striata* var. *crocata* have been cherished for 75 years in New England. They have never succeeded in the open or in lath house conditions with the author at Lakemont Gardens, although occasionally bulbs will survive in the ground in sandy loam for a few years when planted deeply (3 inches down to top of bulb).

In pots when not subjected to frost or freezing temperatures, bulbs of *A. striata* thrive well under good culture. In the greenhouse or in protected beds under overhanging roofs and *in sheltered corners of the garden where frost does not ordinarily reach, they may multiply like rabbits and make huge bulbs of 3 inches or so,* very large for this species. They prefer a sandy loam with extra good drainage, and this may be less protection for these *Amaryllis* in cold spells than heavier more humusy growing mediums.

THE SMALLER (INTERMEDIATE) FLOWERED AMARYLLIS

MRS. A. C. PICKARD, *Texas*

If you enjoy the intermediate as well as the giant blooms, you will enjoy the lovely ''Graceful'' amaryllis clones. We are indeed grateful to Van Meeuwen & Sons of Hemstede, Holland for their foresight in offering this lovely pure red dainty flower.

Many of you will recall the introduction of this original Gracilis strain in 1950 Herbertia. I understand they are out of this stock for a while. Because of outstanding qualities and features, these clones stole the show. They aroused my enthusiasm to the extent that I purchased a few of the clones when first introduced to the market. They are expensive ''fellers'' but through the years the original bulbs have retained their vigor.

These perfectly proportioned intermediate flowered formed amaryllis have the same qualities as the large flowering Dutch hybrids and make excellent pot plants because of their size and pure red color without any green in the throat of the flowers. It does not seems strange that these ''Graceful'' clones will always remain a prized possession because the hybridizer of these rare beauties spent 25 years of the best years of his life in the hybridization and selection of this intermediate strain.

With its interesting background the writer has found after quite a few years of growing this Amaryllis that its cultural requirements are the same as those for the large flowered Amaryllis with one exception. Be stingy with plant food. Keep this particular clone a bit hungry (not stuffed). Always plant a bulb in fertile soil mixture and keep moderately moist during the flowering and growing season. Like their big cousins they like a rest during the early fall months.

It is advisable to use pot culture for several seasons. They are valuable as a blooming pot plant and can be planted more than one to the pot to give maximum bloom in limited space. Each mature bulb will usually produce two to three 18-20 inch scapes topped by 4-6 flowers to each scape, with perfectly formed velvety textured flowers. It is indeed a treat to own even one pot of these beautiful novelties in bloom at Christmas. We feel that at any price they are cheap compared to the quality of florist grown Poinsettias which are often beautiful but fleeting.

Remember if the room temperature is high the blooms cannot last. Also a sunny window will be costly to the flowers. Otherwise with a bit of care the blooms will last for weeks. After the last bloom has died, cut the flowering stalk down to about 2 inches from the top of the bulb and continue to grow good lush foliage during the spring and summer in semi shade. Do not let the pot dry out during the growing season. Then keep an open eye for the ''Graceful'' clone is noted for its prolific offsets, and in no time you will have a bountiful stock. Remove the babies when they develop their own roots and have a tendency to get out in the flower world to flaunt their lovely blooms, and they usually are quite grown up gals in two years.

The flowers set seeds to self-pollination, but it takes at least three years to produce a blooming size bulb from seed and then a year or two longer to decide if the flower is distinct, but all are worth waiting to see. We are anxiously waiting to see our first blooms this spring from self pollination of the ''Graceful'' clone and feel assured some of these seedlings will produce pleasing flowers that have delicate grace and charm.

Amaryllis is the answer to the ''hobby bug.'' For those who are not too particular as to solid colors, Ludwig & Co., of Holland, offer a novelty, ''Ludwig Gracilis'' in a lower price range with medium flowers in mixed shades. The colors vary from orange to rose and most all have a faint streak in the throat.

Speaking of smaller flowers—the dwarf species are not to be forgotten or overlooked. The *Amaryllis striata* and var. *fulgida* all produce flowers of great charm in a range of color from salmon, salmon pink and cheerful red. Usually a pointed star marks the throat of the flowers. The species are excellent seed plants and produce many small offsets that often lie dormant for several months before producing leaves. Due to their delicate color and size these small species will always be stars in the genus *Amaryllis.*

With my taste for growing and hybridizing, I have come to the conclusion there is no cure for the chronic mental ailment ''amaryllisitis'' and I am resolved to make the best of the situation. Grow more amaryllis and enjoy beauty.

COLD STORING AMARYLLIS SEEDS

WYNDHAM HAYWARD, *Florida*

The ''cold storage'' temperatures of an ordinary electric refrigerator in the food compartment are adequate to prolong the vitality and viability of hybrid *Amaryllis* seeds many months beyond their usual span of life in the hot, humid Florida climate. This seems all the more remarkable when it is considered that the *Amaryllis* is a bulb of sub-tropical and in some species purely tropical origin.

This adaptation of the seed to cold storage was shown in the late spring of 1957 at Lakemont Gardens, Winter Park, Florida by the planting of four packets of Ludwig & Co., hybrid *Amaryllis* seeds on May 24th in four 6-inch plastic pots, lightly covered with the same potting soil and watered and shaded for some weeks thereafter.

While there have been reports that *Amaryllis* seeds retained their vitality after a year or even two years in the California climate, Florida weather conditions are notoriously unfavorable for the seed's viability. The Ludwig seeds are imported from Holland by the hundreds of packets by Lakemont Gardens every year, and experience has shown that while the seeds will continue to give a good germination for at least two months after its arrival, which is usually around the 1st of July each season. By September or October however there is a major loss in the seeds' ability to grow.

Some years the seeds retain fair vitality until October or November, but many seasons there will be less than 10 per cent germination of the Ludwig new crop seed planted in those months. Hence the interesting project of storing four packets, two of the pure white seeds, which is always of lower germinating power, and two of the rose-pink shades seed, usually a reasonably vigorous type, in the authors home refrigerator in late summer, around September 1st, 1956, while the seed still gave a good germination result from test plantings 75 or 80 per cent.

The packets were carefully wrapped but not sealed in a polyethelene bag such as is used for food in the electric refrigerators. Tests of the overnight temperatures of the upper shelves of the electric refrigerator showed that these ranged from 35 to 40 degrees F. or so, depending on the weather, temperatures of the house and the amount of heavy ice coating on the freezing unit. No effort was made to control the humidity, but it is presumed that this was reasonably high. Often there would be dripping water from the lower part of the unit onto the catch-tray.

The following year, the seeds were planted 25 (one packet) to a six inch pot, late in May as indicated, the black papery wafers being laid flat on firmed sandy compost, and covered with a light sprinkling of the same compost. The pots were watered every day or two and kept out of heavy drip under a mandarin (citrus) tree, with little direct sun, but plenty of light. In three weeks there were a number of seedlings sprouted, and by four weeks the seeds of pink hybrids had sprouted uniformly 75 to 80 per cent and the pure white seeds gave 11 and 12 seedlings respectively in the two pots from their packets of 25 seed each.

These young seedlings were two inches high and growing fast, ready to be lined out in a flat by the end of June. The germination was as good as may be obtained many times with fresh seed just arrived from Europe. So far as known, *Amaryllis* seed stored at ordinary house temperatures in Florida over the summer, fall and succeeding winter has never shown any germinating power the following spring with the rare exception of an occasional seedling from many seed planted. Often not a single seed will sprout. This seed was conserved in good germinating condition at least six months past its usual life span in Florida.

The only time this seed was exposed to temperature higher than 40 or possibly 45 degrees F. was during occasional de-frosting periods of 10 to 20 hours during the nearly *nine months* it was in cold storage.

VEGETATIVE PROPAGATION OF AMARYLLIDS

Claude W. Davis, *Baton Rouge, Louisiana*

My interest in the vegetative propagation of *Amaryllis* and related bulbous plants began back in the summer of 1955. For about five years I had been growing a bulb of Ludwig's beautiful 'Doris Lillian', and while it bloomed each season it had never produced an offset. I had been offering *Crinodonna corsii* cl. 'Fred Howard' for sale, but natural increase from offsets was insufficient to meet the demand. I know that various plants could be increased faster by cutting up the bulbs, having read of the technique of "cutting" with amaryllids which had developed by Dr. Hamilton P. Traub and published in Science and Herbertia (Traub, 1933; 1934; 1935; 1936) and by I. W. Heaton in Herbertia (Heaton, 1934; 1936). See "Literature cited" at end of article.

I sought information on ''how to do it'' from Dr. Hamilton P. Traub, from Mr. Wyndham Hayward of Winter Park, Florida and from Prof. Ira S. Nelson, S. L. I., Lafayette, La., and received helpful suggestions and encouragement from all of them, so in early September I sharpened up my knife and went to work.

The bulbs were split vertically, as one would cut an apple from the stem to the blossom end. Each bulb was divided into either four or eight sections or ''pieces of pie'', depending on the size of the bulb. Each section was further divided by beginning at the center and counting four or five scales and with the blade of a pocket knife carefully removing these, together with the section of the bulb stem to which they were attached. The process was repeated until the entire section was divided into small pieces of four or five scales held together by a section of the bulb stem.

Before cutting, the foliage was removed at the neck, and the bulb was carefully washed. After the bulb was cut, the sections were soaked for a short while in a mild fungicide. Because it was available, I used Dithane Z-78 at the same strength which is recommended for spraying roses, but any one of several commercial fungicides would help prevent rotting before the new growth begins.

The sections were then placed vertically in a standard greenhouse flat, four inches deep, and covered to the top with vermiculite. The flats were well watered and placed on shelves in a storage room which had windows, but no source of heating in the winter. (It is probable that a mixture of sharp sand and peat would do equally as well as vermiculite for bedding material.) Then came the long wait before new bulbs were formed at the base of the scales and top growth appeared. The flats were kept moist and eventually, in two or three months, my faith was rewarded as new growth began to show above the vermiculite. With heat and more light in the storeroom, growth might have been faster, but the winters are mild in Baton Rouge with temperatures dropping outdoors only a few degrees below freezing, and then only for a short time.

In the spring the new plants were transplanted out of doors in light shade in the ground. The bed was slightly elevated for drainage and the texture of the soil was improved by working into it some sharp sand, peat moss and a small amount of the commercial, dried sheep manure. Two years later (in the fall of 1957) the new bulbs are about the size of a black walnut. If present rate of growth continues the plants should reach blooming size after three years of growth, or in the spring of 1959.

The results from this project were so encouraging that I repeated the process in the fall of 1956 and with a larger number of bulbs. The increase obtained from one bulb of a variety is shown in Table 1 for each of the two years.

TABLE 1

1955	
'Salmon Joy'	39
'Doris Lillian'	44
'Ludwig's Scarlet'	14
'St. James'	21
Dutch white seedling	14
Mead hybrid	31
Crinodonna corsii cl. 'Fred Howard'	39

1956	
'Bouquet'	22
'Sweet Seventeen'	25
'Pink Favorite'	20
'Red Master'	11
'Daintiness'	15
'Ludwig's Dazzler'	8
'Cherry Queen'	16
'Wyndham Hayward'	15
'Queen's Page'	22
Crinodonna corsii cl. 'Fred Howard'	42

The procedure is so simple that these results could be duplicated by anyone with the nerve to slice up a good bulb and the patience to wait for results. In a colder climate it would undoubtedly call for the use of some form of heat during the fall and winter months.

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AMARYLLIS PROPAGATION PROBLEMS

WYNDHAM HAYWARD, *Florida*

Most of the difficulties mentioned below in the propagation of hybrid *Amaryllis* by bulb cuttage have been encountered and studied by various growers in Florida to assure a reasonable success of the method in the hands of any careful grower. A vegetative method of *Amaryllis* propafation was first announced by Miss Luyten in Holland, but the different cuttage method worked out in Florida by Dr. Hamilton P. Traub (HERBERTIA, vols. 1 & 2, 1934 & 1935) has been universally adopted in Holland and the United States.

Propagation by cuttage can be done either in the greenhouse as in Holland and the North, or under lath house conditions in the lower South. The author, who made numerous propagations of named clones and selected seedlings during the 30's and early 40's, prior to World War II, has made careful consultation with John Weisner of Fernandina Beach, Fla., who is the principal American grower doing a major work in this field at this time.

The various problems of vegetative propagation of *Amaryllis* may be grouped under five headings: (1) time of cuttage; (2) technique of cuttage; (3) propagating medium; (4) genetic factors of bulb as affecting the results; (5) treatment and transplanting of propagations.

(1) The time of bulb cuttage into pieces varies from August to October. Doubtless it depends on the time the bulb reaches effective dormancy. Certain strains and varieties of *Amaryllis* will tend to lose their leaves and even their roots in August in Florida cultures. They would probably be satisfactory for use in propagation at that time if the weather is not too hot and dry. A long spell of hot and dry weather in August or September, unless the propagator is prepared or equipped to give the propagations adequate attention in the matter of watering and shading, might be disastrous in results. Most of the *Amaryllis* bulbs will be found to be reasonably matured for the season and going dormant by the middle of October. At least they have made their best growth.

(2) The original technique of Miss Luyten in her cuttage method as described by her in the early numbers of HERBERTIA contemplates a virtual ''gouging'' of the scales of the bulbs from the base or root crown. Dr. Traub's and I. W. Heaton's techniques as described in the early Herbertias call for a vertical sectioning of the bulb like cutting pie on a central axis which is the vertical center of the bulb. The foliage is cut off first, slightly above the top of the bulb, and the root base with any roots attached may be left on, or it is sliced off close to the bulb. In the latter case this root base can be planted with the cuttings and will produce several bulblets in some cases.

The Traub and Heaton methods provide for horizontal sections or cuttings of the vertical divisions if the bulb is large enough, to make two to four smaller propagating pieces of the bulb, all with two or three leaf scales attached to a small piece of the root base or crown. The Luyten method calls for removal of sections of the scale from the root base with portions of the base attached, but it seems doubtful if the importance of having a strong piece of the root base attached occurred to Miss Luyten, as there appears to be little meristem in the scales themselves.

(3) For his propagating medium Mr. Weisner of Fernandina Beach, Fla., has reported that he uses coarse white building sand (presumably white washed fresh-water lakebottom sand) such as is sold all over Florida for building and cement work. In a flat 4 inches deep, he puts two inches of the sand with a quantity of commercial dried, pulverized and sterilized sheep manure mixed in, then on top of that a two-inch layer of the plain white sand with no other admixture. Then the propagations are planted in the top sand, so that the tips of the leaf scales stick out a fraction of an inch or more. The flats are then shaded and protected from frost the remainder of the winter, and watered sparingly when needed to prevent becoming dry. Now and then he may water with one of the commercial liquid fertilizers in weak solution.

The Traub and Heaton techniques call for the use of a sand-and-peat propagating medium. This could vary according to the coarseness of the sand, and the texture of the peat, which should be a fine grade sifted horticultural type. The sphagnum type peat (imported) has usually been used, but unless too sour, it may prove possible to use the southeastern states carex type peat in fine sifted form. Usually a furrow is made in the peat across the flat, and the little pieces of cut *Amaryllis* bulb are set in a row like little soldiers and the peat and sand mixture drawn to them from both sides to cover them. The pieces may be erect or slanting. The tips of the leaf scales should show in a row after planting. The rows may be two to four inches apart in the flat.

(4) The genetic factors involved may be the most important thing affecting the success of the operation on any particular bulb or clone. Certain bulbs have a small base or basal crown by nature and make poor propagators. Certain clones have little vigor genetically and produce few sprouts from the pieces. Certain clones make smaller bulbs naturally and are slow to multiply for that reason in comparison with others. From small bulbs only 24 to 40 cuts may be made while 50 to 75 can be made from a large bulb. However, Mr. Weisner reports that he has settled on 30 to 40 pieces as being most satisfactory for the average cuttage count of his propagations from each bulb. A ''good propagator'' may even produce more bulbs than the number of pieces planted, some pieces producing two, or even three bulblets. Pure whites and pinks are notoriously poor propagators, and one might be satisfied with less than half the usual results in their cases. Some fine bulbs lack disappointingly the power of reproduction when propagated by the cuttage method. Others yield to it like rabbits. Unfortunately the better propagators are usually the poorer quality hybrid *Amaryllis* from an ornamental, artistic or exhibition point of view, but fortunately certain of the finest quality Amaryllis are also good propagators. Tenderness of the bulb to frosts may figure in the result.

(5) At present in Florida the propagations are permitted to remain in the propagating medium in their flats for several months during the winter, shaded, watered and protected from frost as necessary. A sharp freeze in Florida which may occur any winter in December, January or February, can ruin the entire year's crop of propagations as the damp flats are in perfect shape to be frozen several inches deep if left exposed in the unheated lath house outdoors as is the custom in Florida. In greenhouses the precautions against freezing would be unnecessary. Temperatures down to actual frost do not seem to affect the propagations seriously other than to slow down the rate of development of the young bulblets forming on the pieces.

Tiny leaves will begin to show above the flats in December to March, and by April, when the time has come to transplant the propagated bulblets, these will be found, under good conditions, to have developed to sizes from a small pea to large marbles. In Mr. Weisner's technique the bulblets make roots which go down into the sheep-manure-fertilized lower layer of sand, and gain rapidly from that time on. In the Traub method, the bulbs can be watered with any good soluble fertilizer of a well-balanced ration, especially with plenty of nitrogen and potash, which are extremely important to *Amaryllis*.

In spring the bulblets are transplanted to their growing beds in the lath house or field, or to pots and flats with wider spacing, in the usual growing composts. From that time on their handling is exactly similar to the growing of seedlings except that the different clones are carefully grown in separately marked rows. They may be marked in their flats when first planted with waterproof labels, such as the common white plastic kind (Gro-Quick) sold today.

CONTROL THE MAJOR BULB FLY

JOSEPH C. SMITH, *M.D.*

It is advisable for those obtaining bulbs from persons other than competent nurserymen to inspect them carefully for evidence of disease and insect pests. I have received bulbs with a number of things lodged between the leaves at the base. This summer some very valuable white *Lycoris* were received, and it was noted that some were softer than others. One was then cut open lengthwise through the center between the leaves, and a large grub of the Narcissus or major bulb fly was found eating out the heart of the bulb. The rest of the bulbs were cut and a single grub was removed from each. These were killed and the halves of the bulbs planted. Fortunately lycoris will propagate by cutting in this manner, and leaves have appeared this fall where the halves were planted. Most of the amaryllids will propagate from a cut bulb, and it is much safer to find and kill these larvae than to risk infesting your area when bulbs come from an area known to have the greater bulb fly. The lesser bulb fly is not so vigorous and its larvae usually attack and succeed in killing only diseased and weakened bulbs.

Control measures of bulb flies will be found in Dr. Traub's new book, ''Amaryllis Manual''.

HYBRID AMARYLLIS IN THE GREENHOUSE

J. F. STEWART, *California*

This article is based upon the writer's experiences in the glasshouse culture of hybrid Amaryllis at Downey, in Southern California, and does not cover conditions encountered in colder climates where the houses are artificially heated, although the general culture should be similar in all cases, except that in the heated houses, with their high humidity, there would be greater danger of fungus attacks. Our houses are not heated, other than the small amount given off by the propagating beds, but there is a gas connection in the larger one for the possible emergency use of a heater in winter weather.

Numerous types of houses are available, from lightly constructed small and comparatively inexpensive ones with wood frames, to very ornate and beautiful ones of wood or metal, and the more or less standard commercial types. They can be erected by a carpenter or a good do-it-yourself man. Some are sold assembled in sections that can be erected by the purchaser, and some are erected complete by the manufacturer. Each individual will match his glasshouse to his own conditions, but in our case the choice was limited by financial considerations. Large houses are more satisfactory than small ones. One thing should be stressed; get the highest quality possible, even at some sacrifice of size. Your glasshouse should outlast you.

Since for hybrid Amaryllis culture two of the most important considerations are light and ventilation, heat being a separate one governed by special conditions, the house should be set in the open, away from buildings and trees if possible, with the door and ventilator openings so located as to take advantage of the prevailing winds. We use greenhouse glass paint to filter the sunlight for one house, and widely spaced lath on the other, but do not like the lath and will remove it and use paint on both houses from now on. The function of the paint is to exclude enough of the sun's rays in summer to keep the heat within reasonable bounds. It can be washed off by the fall rains, or a hose if necessary, to admit more light in winter. Most plants, including hybrid *Amaryllis,* tend to be compact and stocky when grown in full sunlight, but to stretch out and become leggy and tender when grown in subdued sunlight or shade. Between these extremes a compromise must be reached as to the density of the paint to be applied to the glass.

We have pot benches all around the walls of the houses, except at the doors, and propagating benches in the center of the larger house. The tops of the benches which are to be used for potted bulbs are made of one inch by three inch slats, spaced about one inch apart to allow air to circulate. Ours are 39″ wide and 31″ high, which is about right for a tall man. The propagating benches, or hot-beds, are made solid, without spaces between the boards, and have sides and dividing partitions 6″ high. Holes are bored in the bottoms for drainage.

The house is wired for lights and outlets for the electric soil heaters. These are flexible lead covered wire heating elements coiled on the bottom of the propagating beds, and controlled by thermostatic switches to maintain the desired temperature range. The matter of propagating will not be gone into here, but will be discussed in another article.

The glass in the east and north walls is not painted, and in the south and west is painted down to the tops of the benches only. This lets in enough light under the benches to make it possible to use most of the space under the benches around the walls for seed beds, where we start our best seeds. Here the original soil, a sandy loam, has been retained and is used as is. The seeds are sown, thickly, in furrows about 3/8″ deep, which, instead of being v-shaped, are flat bottomed and about 1½″ wide. These rows are spaced at 6″ center to center, and run at right angles to the glasshouse wall. The soil is lightly packed on the seeds, smoothed over to make a flat, level bed, watered with a fine spray, and then kept continuously moist, but not soggy, until sprouting is complete. The soil should not become caked. There is some drip from the pot benches above but it does not become a problem. When sprouting is complete, fertilizing should be started, using a fertilizer high in phosphorus and potash. We use 5-10-10 placed as a narrow band between rows, using about a level tablespoonful to the 30″ row, working it in with the small hand cultivator and watering well with a fine spray. This is repeated at about eight week intervals until time to transplant the bulbs the following season. For safe transplanting to outdoors, the bulbs should be at least a ½″ in diameter, and should be well watered until established, being sure that the water reaches the roots. Transplanting during a hot dry spell should be avoided. Scarce or highly valuable seedlings should be transplanted to flats or small pots until they are an inch to an inch and a half in diameter before being put outdoors or into permanent pots.

It is quite true that a well grown Amaryllis bulb will bloom under almost any conditions, even to the extent of putting out a low grade bloom with no soil at all, but it will respond readily to good treatment. There are probably as many different opinions about the composition of an ideal potting soil as there are Amaryllis growers, but it seems safe to say that it should be neutral or slightly toward the alkaline side. It should be sufficiently loose for good drainage but not so loose that water will run through and leach out the nutrients, and should be fairly rich, with a high proportion of phosphorus and potash. We try to use a mixture of one part leaf mold or compost, one of building sand and one of our own garden soil. To this we add finely ground bone meal (bone ''flour'') at the rate of one measuring cup to a batch of about two cubic feet of the mixture, and about a half cup of agricultural lime. The amount of lime would possibly vary for other soils. This should be turned and screened until thoroughly mixed. Animal manures are to be avoided, except such as have previously been thoroughly assimilated by the soil or compost. Note that too much nitrogen promotes tender leggy growth. This soil should be moistened and allowed to stand until the moisture is thoroughly distributed, so that a squeezed handful will hold its shape in the opened hand, but can be readily crumbled without leaving lumps. It is essential, and this is important, that the soil be neither powder dry nor soggily wet when used. The powdery dry soil will completely and solidly fill the pot, and then when watered will swell and compact, making root growth difficult and drainage poor. Too wet soil will give similar results by puddling and forming a hard lump when dry, which condition is difficult to remedy, except by repotting.

It is advantageous to have a good sized potting bench, large enough to hold the soil, pots, and tools, and of a height to suit the user. The back and sides should be at least six inches high, to retain the soil and equipment. A simple bench is easier to keep clean and sanitary, but it can be fitted with bins, shelves, and so on, if desired.

Now comes the question of containers. Again arguments will arise, and it would be difficult to justify any arbitrary rule, but here is the way we see it. For seedlings, propagations, and small offsets, use nothing smaller than four inch pots, because smaller ones dry out too rapidly, in them the bulbs become root-bound too soon, and it is difficult to keep the fertilizer away from the bulbs. Full grown bulbs, except the extra large ones, do well, and bloom well, in six inch pots, but we use eight inch to allow offsets to grow to good transplanting size. Dipped gallon cans are good containers, but do not aerate as well as pots, do not last as long, are more difficult to transplant from, and the bulbs in them seem to be less disease resistant than those in pots. The soil surface should be nearer the top of the can than the pot. Glazed pots are not nearly as satisfactory as common clay ones, and we have discontinued using the former.

Potting must be carefully done. When bulbs are transplanted from the garden to pots during the growing season, all roots are retained, and, because of the profusion of roots, great care must be taken to assure that no air space remains under the base of the bulb. In the bottom of the pot we use a pot shard, with one edge resting on another small piece, over the drain hole, then about one half inch of crushed rock, and then about three inches of soil. Work a good handful of soil in among the roots to make a ball at the base of the bulb and set it in the pot, fill the balance of the pot and lightly compact the soil. When potting dormant bulbs, the roots of which are quite short, proceed as above, except that a mound of soil is formed at the center of the pot, on top of the three inch layer, over which the roots are spread with the base of the bulb directly on the mound of soil, then the balance of the pot filled and lightly compacted. All this is to be gauged so that when the potting is completed the bulb will be set with about one half of the base portion, exclusive of the neck, in the soil, and the top of the soil about three quarters of an inch below the top of the pot. Set the pot in its place on the bench and water it slowly, so as not to wash the soil.

This is the time to mark each bulb with a permanent marker. We are using aluminum strips now, about ¾″ wide and six long, which we mark with steel stamp numbers, using a simple code of our own for basic data, and a serial number under which we record specific information in a notebook. We use this serial number arrangement throughout our work for keeping track of seed beds, flats, bulb rows, potted plants, etc. If a marker is lost it is then necessary to wait for blooms; maybe three years. Keeping the bulbs in color groups is a good idea.

[To be continued in **Plant Life, Herbertia Edition,** 1959.]

NOTES ON STERNBERGIAS

William Lanier Hunt, *North Carolina*

Sternbergias are certainly the fall blooming yellow flowered bulbous plant pre-eminent for parts of the United States where their winter produced foliage can survive. Nothing can touch *Sternbergia lutea,* (Bot. Mag. sub. t. 290) for sheets of yellow in September and October. They are tough, easy to grow and extremely satisfactory in the landscape, as they do not have to be often transplanted to flower. The evergreen foliage is handsome as a ground cover in winter and lasts in good condition, most years, until daffodil foliage goes down. Mrs. Wilder, in her Adventures with Hardy Bulbs, remarked on the fact that *Sternbergia lutea* was hardy in protected spots in the vicinity of New York City.

There appear to be several of *Sternbergia lutea* in collections and gardens in this country. The old form from early Virginia gardens is a tried-and-true for the South above Middle Florida. From an old garden in North Carolina, the writer has collected a very wide leaved form which may be a form of *S. lutea.* The blossoms are rather small and the scapes short. Flowering some time after the Virginia type, these plants are valued more for the handsome wide winter green foliage than for the flowers.

A few years ago, the writer was astonished and rejoiced to find in a "ten cent store" some small bulbs of *Sternbergia.* They have turned out to be a form with much lighter green leaves than the Virginia type has—even when given the same fertilizer. The flowers are smaller and not so freely produced, and the advantage in having them seems to lie in their somewhat late season which overlaps with that of the Virginia aristocrats and continues for a week or more. A nice surprise amongst these bulbs was a form of *Leucojum* with *teeth edged* scape! This one does not seem to fit into my friend, Sir Frederic Stern's book anywhere!

The writer has never grown the two species of "cylindrical flowered" sternbergias: *S. colchiciflora* and *C. macrantha,* said to bloom in the fall in England and to produce the foliage in spring. These are well illustrated in Bot. Mag. sub. t. 744 and in Bot. Reg. sub t. 2008. Mrs. Loudon's The Ladies' Flower-Garden of Ornamental Bulbous Plants has pictured *S. lutea* and *S. colchiciflora.*

The "spring flowering" *Sternbergia fischeriana* begins to flower in my North Carolina collection in November. The foliage is then about two inches long. Buds appear, and on the warm sunny days which ensue, the first flowers open on scapes of an inch or more. Toward Christmas, the leaves have attained four to five inches and begun to show their beautiful habit of twisting into spirals. Flower scapes are then three to five inches long, and the patch becomes an eye-catching spot.

Nowhere is the semi-glaucous foliage of *S. fischeriana* better illustrated than Parkinson's *Paradisus.* Faithful old Parkinson has shown us exactly how this foliage looks. In middle Carolina, the temperature drops to a few degrees below zero for a few hours in the night in early January. This freezing does not affect the handsome twisting foliage at all. Neither do the regular sudden drops of forty degrees and more in four hours. While *S. lutea* is lying more or less on the ground in cold weather, *S. fischeriana* seems to defy the cold with erect foliage. The flowers get frozen, but more are immediately produced like those of *Iris unguicularis.* Seed vessels are produced on *S. fischeriana,* and it will be interesting to see whether crosses can be made with the other species and forms. The writer has not consulted the CHROMOSOME ATLAS on this subject.

For cultural and landscape notes, see PLANT LIFE, Vol. 8. No. 1, 1952, page 119. In that article, the writer stated that he was going to see if a planting of bulbs over ten years old might be made to flower again without transplanting by scattering an inch of good soil and some bone meal over the top and then replacing the mulch of pine needles. Results: the 2nd year after this treatment, fourteen out of the average of sixty-six bulbs in each clump flowered. Of course, such a planting must soon be taken up and replanted because of over crowding, but this treatment worked at a time when it was impossible to dig. Who shall say, however, that Laziness, not "Necessity", ". . . is the mother of invention"!

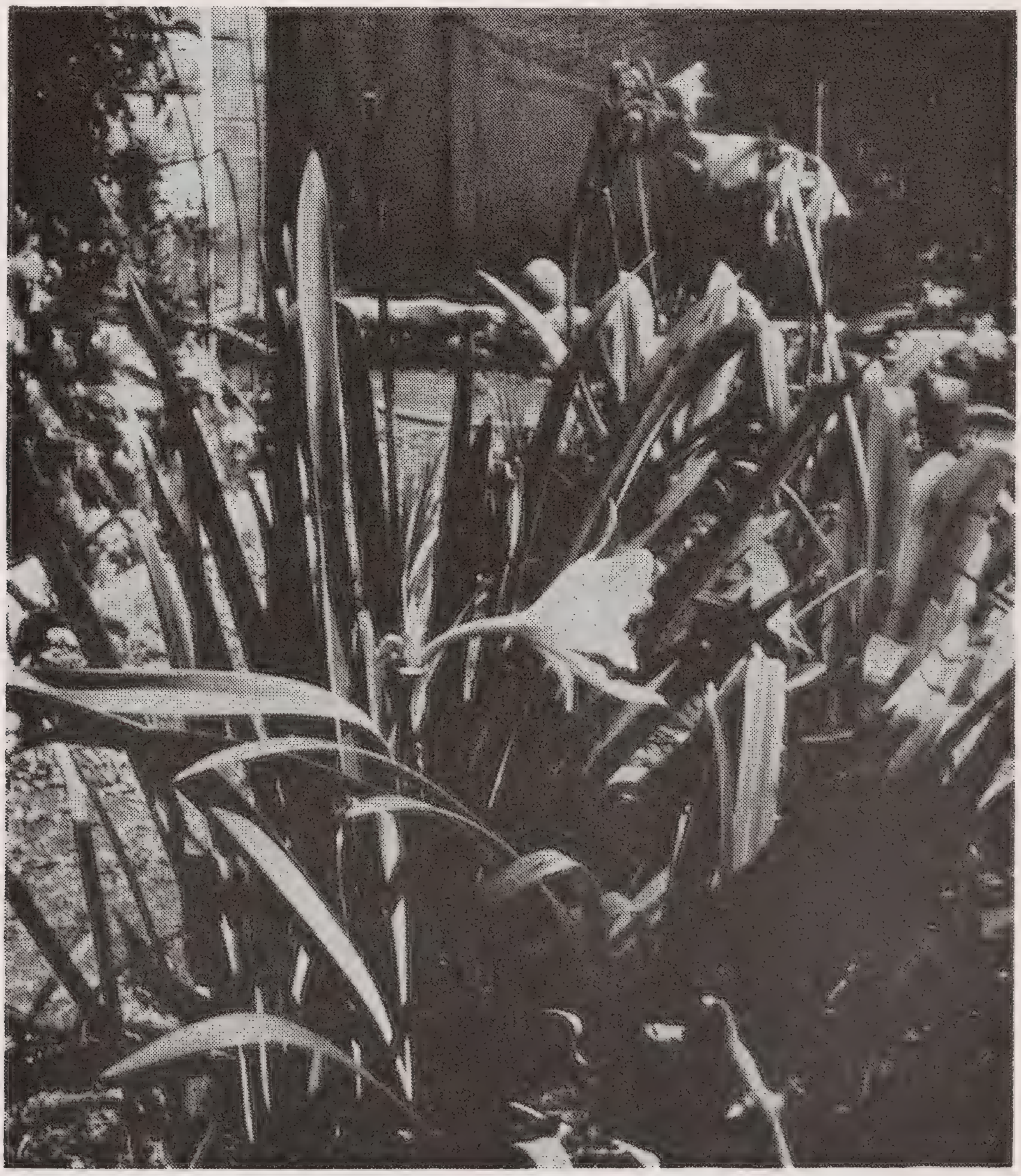

Fig. 16. Paramonga Lily, *Paramongaia weberbaueri,* from Peru, side view, as grown in Dr. Traub's garden at La Jolla, Calif. Photo by Dr. Joseph C. Smith.

Still more landscape notes can be found in HERBERTIA, Vol. 3, 1936, page 145. It was the zephyranthes meadow pictured on page 143 of this 1936 issue that inspired the writer to search for more bulbs, other than the common spring flowering ones, with which to reproduce this wonderful effect.

THE PARAMONGA LILY

JOSEPH C. SMITH, *M.D., California*

This is the most beautiful amaryllid you can hope to see. Nothing surpasses it in beauty unless you happen to be partial to red and then only the giant red hybrid *Amaryllis* will rival it. The PARAMONGA LILY is a bright canary yellow flower among its upright medium green foliage. In addition it possesses a spicy nutmeg aroma. Like the Inca civilization it was found hidden away in the Andes of Peru. It was sent for identification from Peru to Dr. Traub.

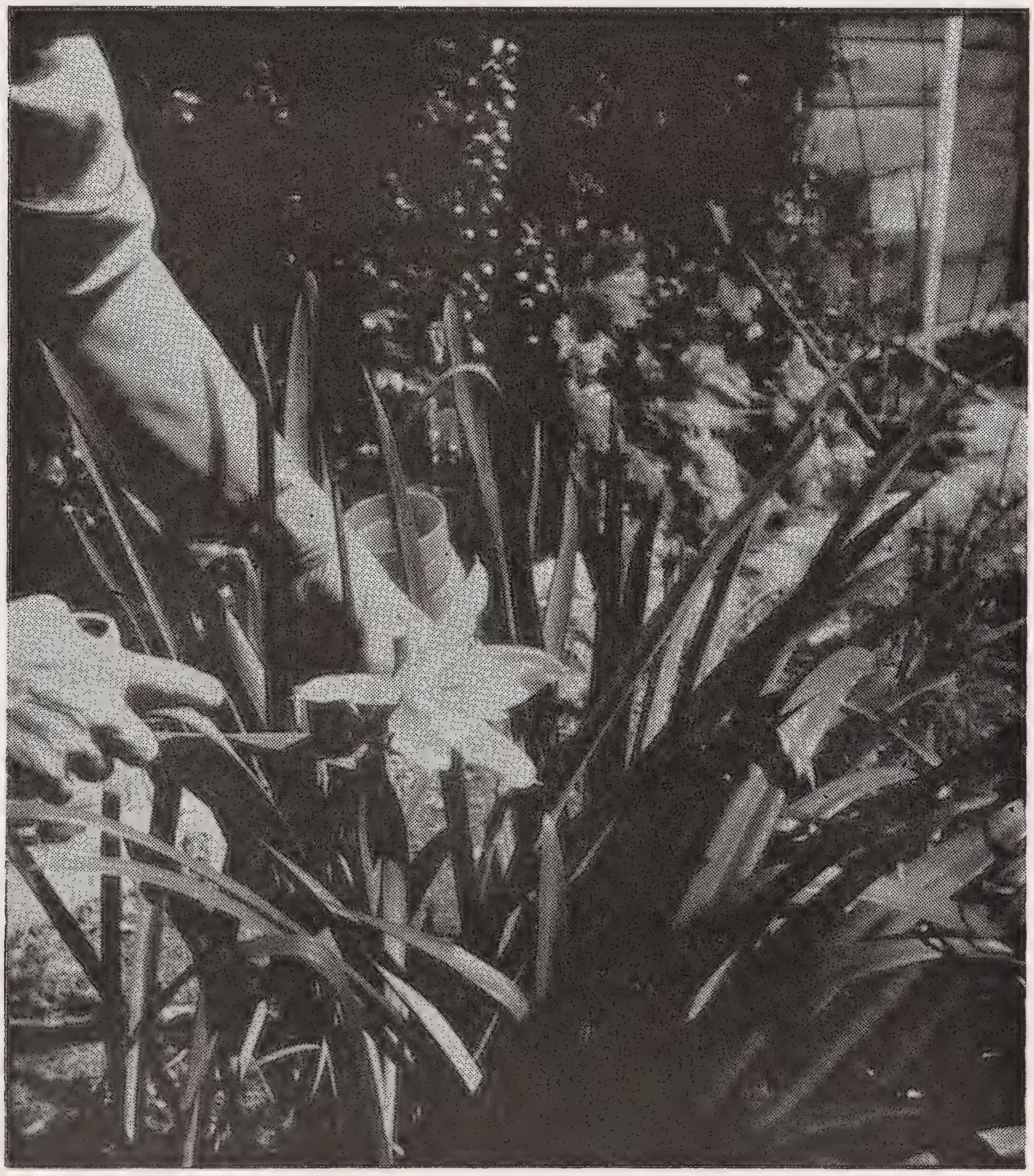

Fig. 17. Paramonga Lily, *Paramongaia weberbaueri,* from Peru, front view, as grown in Dr. Traub's garden at La Jolla, Calif. Photo by Dr. Joseph C. Smith.

The scientific name of this plant is *Paramongaia weberbaueri* which was taken from the ancient ruin of Paramonga its native habitat and the name of Dr. Weberbauer, who specialized in Peruvian botany. In the classification of plants it finds a place between the *Pancratium* and the Ismene group of the *Hymenocallis.* Its structural form and growth habits are much like the Ismene but the bulb has no pseudo-neck and its seed are flattened and black more like those of the pancratiums.

The accompanying pictures (Figs. 16 and 17) were taken of a specimen flowering in Dr. Traub's garden at La Jolla, Calif., in 1957. This is the second year that he has flowered it. Last year the flower was of necessity turned into an herbarium specimen. A few seeds were set this year and distributed, three to a person, as far as they would go. Every effort will be made to get this magnificent plant into wide cultivation as fast as possible. It makes offsets about as readily as the Ismene group and with more seed per capsule a faster spread of this plant will be readily accomplished.

Cultural requirements are the same as those of Ismene group in this area. Minimum temperature tolerance has not been checked. However, with winter dormancy they can be handled like the Ismene group and they will most likely succeed as well in most areas. In southern California they can remain in the ground the year around and be expected to flower each returning season. Here the bloom comes in June or July, a little later than most of the Ismene group and nearer the blooming season of *Pancratium maritimum.* Like the latter its seed pods require longer to ripen than do those of the Ismene group which usually ripen in four weeks or less. *Pancratium maritimum* requires eight weeks or better to ripen its seeds.

It is possible that paramongaia may cross with some of its nearest genera as the Ismene group, *Pancratium,* or *Pseudostenomesson.* This will be checked.

How this desired species escaped capture into cultivation so long is hard to understand. But, now that it is in captivity it will most certainly be popular with its ease of cultivation and its marvelous possibilities in flower arrangements.

SENDING SEEDS BY MAIL

Hamilton P. Traub, *California*

Seeds are often sent by mail in letters. In the past most were sent in ordinary paper packets without additional protection and the results have been disappointing in many cases due to broken seeds. One well-known seed house wraps larger seeds in a small amount of cotton fiber around the seeds and this mass is then placed in the packet which in turn is placed in the letter envelope. This gives some protection, but the writer has received such seeds as *Worsleya rayneri* wrapped in this manner with loss through breakage since the cotton fiber flattens very easily. Thus a better method has to be found.

When seeds are not rare, the writer places the seeds in ordinary seed packets and protects the seeds by stapling medium stiff (medium weight and somewhat flexible) corrugated pasteboard on both sides of the packet. The protected packets are then placed in the letter envelope, and the notation, ''Please Hand-Stamp'', is put on the outside of the envelope. So far no reports of losses have been received.

When sending *very rare larger* seeds, it is better to use a card of stiff corrugated pasteboard slightly smaller than the letter envelope. Small excavations are made on one side of the board, the seeds are placed in these, and then scotch tape is placed over the open places that house the seeds. This method was used in sending out the total 1957 crop of 31 seeds of the outstanding new amaryllid, *Paramongaia weberbaueri.* In order to obtain wide distribution in the shortest time, 4 seeds were sent to Mrs. Morris Clint, and three seeds each to nine other amaryllid enthusiasts in the United States and Great Britain. Reports have thus far (January, 1958) been received from Mrs. Clint, Mr. Hannibal and Mr. Woelfle, who have all obtained 100% germination, each using a different method for germination. It will be interesting to make a more complete report including the results obtained by the remaining experimenters in 1959 HERBERTIA.

Mr. Wyndham Hayward, Winter Park, Florida, writes under date of December 9 that two of the seeds of *Paramongaia weberbaueri* are up, growing nicely, and came through the recent light frost with no damage.

Footnote.—Mr. Woelfle wrote later that his Paramongaia seedlings damped off.

GERMINATION OF PARAMONGAIA SEEDS

KATHERINE L. CLINT, *Texas*

On September 13, 1957, we received 4 seeds of *Paramongaia weberbaueri* from Dr. Traub, who wrote that this Peruvian amaryllid was spectacularly lovely but very rare indeed, with but few seeds available for distribution. Our ultimate success seems to justify recording the entire process in some detail.

A 5″ azalea pot was filled to within an inch of the brim with our standard potting soil, which consists of 1/3 sand, 1/3 peat and 1/3 soil, plus a small amount of crushed granite. After watering enough to settle the soil somewhat, we added a ½″ layer of our pet germinating medium: 1 part finely sifted, well-aged peat, 1 part parakeet or bird gravel and ½ part screened sphagnum. This was also dampened and the seed inserted vertically in the medium so that only the bare tip of the upper edge was visible. The pot was then watered thoroughly and placed in the greenhouse. This was on September 15. Neither glass nor plastic was used to cover the pot and subsequent watering was purposely held to a minimum for fear of rotting the seed. Stored or fresh rain water was used at all times.

During the ensuing period, we had an unusually high percentage of germination—with many kinds of seed—which seemed to indicate that all conditions were perfect for most seed germination. Consequently, when a month passed and *Paramongaia* showed no signs of sprouting, we felt more than a little worried. About October 17, we had a period of light drizzling rain and the pot of seeds was taken outside to take advantage of this (for us) sure-fire cure for hard-to-germinate seeds.

Even this failed, for although one seed seemed to swell briefly, germination did not take place—10 or 12 days passed and the little worry changed to distress—clearly a change in tactics seemed indicated. I remembered how hard and firm the seeds had appeared before planting, so decided to give them the ''wet'' treatment. During the approximately 45 days since planting, the seeds had become partially uncovered, so they were re-covered completely with a mixture of half and half bird gravel and finely sifted fir bark (about ⅛″ deep). It was hoped that the highly acid fir bark plus a heavy daily watering would succeed in breaking through the apparently tough seed coat. Now, whether it was the proper time for germination to occur and the new treatment merely completed the process or whether this method, if started earlier, would have cut the germination time is still an unanswered question. The fact remains that results were immediate and startling. In 3 or 4 days, the first seed began to swell and was soon above ground, with the other 3 following in rapid succession. On this date—November 22—the seedlings are from 3 to 5 inches high and growing lustily.

GERMINATING SEEDS IN VERMICULITE

L. S. Hannibal, *Fair Oaks, California*

The germination of any seed, whether a husky cocoanut or the microscopic product of an orchid, represents no difficulty when the right environments for growth are established, but deviate from the required conditions and anyone is bound to encounter failure. The *Amaryllidaceae* are no exception. All members of this family have rather specific requirements, but as a general rule very few are as difficult to germinate as most people have been led to believe.

First, in practically every species of the *Amaryllidaceae,* the seeds require moisture and high humidity during the period of germination—It matters little whether it be a tropical *Zephyranthes* or trumpet *Narcissus* from northern Europe, moisture must be readily available until the bulblet is established and rootlets functioning.

Secondly, one can not overlook temperature. For some *Crinum* and tropical *Amaryllis* a germination temperature of 70 degrees or thereabouts appears desirable, but for the semitropicals a temperature between 65 and 70 appears more successful, and temperate-climate bulbs do better slightly below 60 F. In practice one should hold to the lower temperature limits in lieu of the higher to avoid dampoff or decay. Germinate your seels after the heat of the summer is completely over.

Third, one must consider the planting medium, and with the *Amaryllidaceae* this is a critical factor. In the native environment most species grow in open meadows or brushy hillsides where the soils are normally heavy loams and well mineralized. True, there are a number of ecological exceptions about the Caribbean where species are found endemic to acid or sandy soils, or to alkaline coral formations, but these are in general exceptions.

Actually, if one were to examine various germinating seeds in the wild little of them would be found covered with soil. The greatest bulk would be scattered in amongst damp decaying vegetative litter. The initial rootlets would be striking down into the loam and primary leaflets fighting to find a bit of sunlight. So we can ask frankly why plant seeds of *Amaryllidaceae* in soil when nature rarely does so herself?

Some years ago the USDA station at Beltsville suggested planting seeds on living spagnum moss. Like others the writer tried this, but found it hard to keep the moss sufficiently moist. At about the same date expanded Vermiculite appeared on the market and this too was tried as a planting medium. Of the two vermiculite was found better suited to Amaryllids since the seedlings were free of the red fungus which is so common in *Amaryllis*—nor were the rootlets stunted or burned by organic acids from decaying spagnum moss. This latter condition is more prone to appear in *Nerine, Brunsvigia rosea* (Cape Belladonna), and other *Brunsvigia* species.

The writer has forgotten just when he first tried sealed plastic containers to hold the moisture content constant within the vermiculite but it has proved to be the perfect answer to a dire necessity. The containers with the germinating seeds could be left for weeks unattended and rarely did one lose any. 100% yields were the usual thing, and if the bulbs were small like *Zephyranthes* or *Nerine* they could be left in the sealed container for a year or two. In several instances Plant-Chem or other chemical growth mixtures have been tried sparingly in the vermiculite, but the benefits have always been slight. Excluding nitrogen the vermiculite contains enough mineral to maintain vigorous growth.

Larger seeds like *Crinum* also germinate readily by this treatment. Such seeds are placed on an inch or two of moist vermiculite in a glazed ceramic dish such as used for watering chickens. These dishes are covered with a sheet of glass to retain the moisture, and the bulblets are only removed after roots some three or four inches long are in evidence. At this stage the bulblets can be planted in deep flats or out of doors in regular beds.

So when the writer recently received three seeds of *Paramongia weberbauer* from Dr. Traub, they were tucked away in a dry location until the heat of the summer was over. Then in early October some fairly fine fresh vermiculite was placed in a clean plastic food container and given sufficient water to make the entire mass moist. The dry seeds were tucked into the moist vermiculite edgewise such that each seed was just covered. Germination took from 2 to 4 weeks. Now at five weeks all seeds have vigorous rootlets and two have primary leaves 2 inches long.

The only question which the writer can't answer is why winged seeds germinate better when planted on edge. The late Hermon Brown noted this phenomenon. (See also Traub, HERBERTIA 1953, page 122.) It may be that germination is effected better if the seeds are aerated by partial exposure thus imitating in part the almost total exposure under natural conditions as explained earlier in this article.

A HARDY GOLDEN LYCORIS

SAM CALDWELL, *Tennessee*

Having had a deep interest for more than 25 years in acquiring and growing all the different kinds of lycoris available, I was greatly thrilled recently to ''discover'' right here in Nashville, Tennessee a fine, hardy, golden-flowered lycoris that may turn out to be a species new to cultivation. The ''tip-off'' came from a local listener to my garden radio program. I followed the lead and came up with this story:

Back in the 1920's, Mrs. Oscar Nelson, now residing with her husband in Nashville, was serving as a missionary for the Southern Methodist Church in Huchow, China. Her mother, the late Mrs. Henry Sperry, visited her in Huchow in 1924 and '25, returning to the States in October, 1925. She brought to Nashville with her one or more bulbs of a golden ''spiderlily'' that grew wild in the Huchow area.

That was the start. The bulbs lived, bloomed, were admired by friends and were shared by Mrs. Sperry with members of her family and probably a few friends, but they were never widely distributed. No one apparently knew of their rarity. Some bulbs were lost in changes of residence. I can now find only a few people who have them, though they seem to increase at a modest rate and are quite healthy and satisfactory bloomers in this climate. They have now been grown here, outdoors, for 32 years.

I have yet to see the flowers, but saw color slides of two clumps flowering in a local garden last summer. In the slides the blooms appear to be almost identical with *Lycoris aurea*, except that their color is apparently deeper. In fact, people here who have had this lycoris for years refer to the flowers as being orange colored. Deep gold is probably more accurate. The scapes appear to be 15 to 20 inches tall, and the flower tepalsegs are curled and crinkled along their edges as in *L. aurea*, *L. radiata* and others.

This lycoris differs in growth habit from *L. aurea* and *L. traubii,* two other yellow species with which it might be confused. Whereas both of these two start foliage growth in the fall, the new one (which for convenience I am calling ''L. sperryi'') makes leaves in spring, as does *L. squamigera;* they die down later and blooms come on bare scapes in August, according to my local informants. Some of these data will have to be confirmed by my own observations.

I've managed to secure several blooming size bulbs. They are relatively large—around two inches in diameter, with long, tapering necks to make a total base-to-tip height of about 5½ inches. They look, in fact, like good, mature bulbs of *L. aurea,* as that species grows around St. Augustine, Fla.

This new one is self fertile. One local grower saved seed from her blooms of last summer and gave me four to plant. They are large, round, shiny and black—much like seeds of other fertile lycoris I have, except that these are extra large, about three-eighths of an inch in diameter.

One thing that surprises me is that this particular lycoris was not introduced to cultivation in this country years ago. The bulbs must have been easily available to collectors. ''They grew wild and were fairly plentiful on the hillsides and mountains between Huchow and Hangchow,'' Mrs. Nelson told me. ''We used to go out and gather the blooms, which came in July or August, if I remember correctly,'' she added. The area is in Chekiang Province, about 100 miles from Shanghai.

''It is in about the same latitude as Jacksonville, Florida,'' said Mrs. Nelson, ''but the winter climate is much colder. There was snow and ice, and the canals sometimes froze over so we could walk across them. Winters were about as cold as we have in Nashville, but were shorter. There was not much real cold weather until late December, and it began to warm up in February. March and April (probably when the lycoris foliage was growing) were usually very rainy months.''

Now that I have bulbs of my own to observe, I'll be reporting further on this lycoris. Leaves and scapes will be air mailed to Dr. Traub. The plant is definitely different from and much hardier than both *L. aurea* and *L. traubii.* At this writing (Dec. 15, 1957) both of these species are in full leaf, having started their foliage back in September. *''L. sperryi''* is quite dormant at this time. *L. aurea* is so sensitive to cold that I have to keep it in pots, under glass. *L. traubii* is somewhat hardier. I've had it in the past, but am testing it out of doors this winter. The leaves appear badly damaged by a recent 9-above-zero freezing spell, but I am hoping they will recover. A planting of *L. traubii* outdoors, but in a very protected spot, at Memphis, Tennessee, has been doing well and blooming for three years. I fear that our more severe Nashville winters may prove too much for it, but will not know for several years yet. The new ''L. sperryi,'' of course, could be hardy much farther north, since it remains dormant through the winter and, like hardy species *L. squamigera* and *L. sprengeri,* makes foliage in the spring.

There is a good possibility that this ''L. sperryi'' is exactly the same as *Lycoris chinensis,* described in this issue (the one growing at the U. S. D. A. Plant Introduction Garden in Glenn Dale, Md., under the label, ''L. aurea''). Dr. John L. Creech gave some details on that one in the April, 1952 *National Horticultural Magazine.* It is described in detail by Dr. Traub in this issue. It is clearly *not* the *L. aurea* seen around St. Augustine, Fla., which I assume is the true species. The U. S. D. A. stock has lived for some years in Maryland, and according to Dr. Creech, ''. . . foliage appears in spring, disappearing in May . . . flowers in early August.'' Those details don't fit the true *L. aurea* or *L. traubii* at all, but do coincide with the habits of the Nashville *''L. sperryi.''* By careful checking and comparing, we should be able to clear up some of this confusion in 1958.

Meanwhile, this golden colored lycoris—whether a new species or a hardy variant of an old one—should make an excellent garden subject and should open up new avenues for the hybridizer. Fortunately, its bloom period covers or comes very near to the time that several of my other fertile species of lycoris are flowering—*L. sanguinea, L. radiata, L. haywardii* and *L. sprengeri.* So with the "new blood," I'll attempt many new crosses in 1958.

I regret that no bulbs of "L. sperryi" are available here at this time for distribution to interested fanciers. I shall try to increase my own small stock in order to share it with others. However, the natural increase by offset is evidently not very fast. The few people here who have bulbs only wish they had more. Perhaps these notes, if published, will come to the attention of someone else who knows this lycoris and a source of supply.

AGAPANTHUS FOR SOUTHERN GARDENS

William Lanier Hunt, *North Carolina*

The great need for blue summer flowers in Southern gardens inspired my attempts to grow agapanthus in my test garden in middle North Carolina. The results have been favorable indeed, as none of the following has ever been winter killed in an area where we have an inch of frozen ground in some winters. *Agapanthus africanus mooreanus* and its form, *minor, A. intermedius* (?), *A. pendulus, A. orientalis,* "dwarf mountain form" and *A. inapertus* have all survived at least five winters in this garden with only a two-inch mulch of pine needles.

The tendency of the foliage to come out too soon and to be killed back in spring or the time of formation of flower buds are the two factors suspected as the reason for little bloom from the plants. However, they may have been starving to some extent, and so they were fertilized this past summer with an extra feeding of cotton seed meal to which they responded at once. We shall see what the results will be in 1958.

There seem to be innumerable forms of agapanthus wandering around the collections in England. The Hon. Lews Palmer, Hon. Treasurer of the Royal Horticulture Society, discovering my passion for agapanthus at tea at one of our shows in Vincent Square in 1956, invited me down to see his collection and the work he is doing in breeding the best forms he has gathered together in his garden at Winchester. Mr. Palmer's articles and awards for these plants can be found in The Journal of The Royal Horticultural Society. The most recent of these is in Vol. LXXIX, Part One, Jan. 1954, page 25.

One sees agapanthus of the *mooreanus* type growing outdoors in many English gardens, and the botanical gardens usually have large clumps of different types either in cold frames or just up against the greenhouse walls. At the Edinburgh Botanical Garden, I noticed the following: *A. pendulus,* Transvaal, *A. inapterus* (!) (for inapertus), *A. patens,* 13-20, Orange Free State, campanulate flowers, *A. longispathus,* 107-45, *A. erectiflorus,* 120-44.

At Kew, the old clumps of agapanthus raised years ago by my friend, the late Mr. Raffill, are still to be found, here and there around the Temperate House. They used to be in tubs on the terrace in summer. It was Mr. Raffill's plants which originally inspired me to try them for cold hardiness in the Southern United States. Since that time, Mr. Giridlian's work has developed many beautiful varieties, and these are all to be tried out here. For such a display as one gets from these gorgeous blue flowers, it would be worth either covering them in winter in the Southern States or taking up the rhizomes as we must do for the tender, showy old plants of "The Blue Lily of the Nile" which our grandmothers grew in their "pits".

HYMENOCALLIS NOTES

JOSEPH C. SMITH, *M.D., California*

During the year at least one more *Hymenocallis* species has been relocated—*Hymenocallis latifolia*—and identified by Dr. Traub. It has been reintroduced from Mexico by Mrs. Morris Clint and located in cultivation at Punta Gorda, Florida by the writer. This is a most desirable species, and it is hoped that it can soon be distributed widely in cultivation. This will no doubt be accomplished quickly due to the fact it sets seeds and produces offsets freely.

The writers supply of this species was obtained through Mr. C. L. Burlingham of Punta Gorda. Mr. Burlingham states that his plants were grown from seed secured some years ago from the gardens of other residents of that city. All of the plants studied from this source appear to be identical, however, some variation or hybridization might appear as there are wild species in the area. This uncultivated species from the fields has not as yet been identified. It is a smaller species with only one greenish flower in the wilds but produces two or three in cultivation.

Hymenocallis latifolia from this source is a very beautiful plant especially when grown in partial shade. Its shiny medium green leaves are broad and upright reminding one of a hybrid amaryllis especially when grown with the bulb half out of the soil. Specimens grown in full sun show more bloom on the leaves and a cupping in their upper half. A definite bulb-neck varies in length according to the depth the bulb is planted. On bulbs planted at the soil surface it is relatively short two inches or less whereas on deeper plantings the leaves fan out at the soil surface with a neck of corresponding length.

The umbel contains eighteen flowers on mature specimens. The color is white and the tepalsegs are narrow. The cup is funnel-shaped with widely flaring edges and is approximately one and a half inches in diameter. The fragrance is exquisite reminding one somewhat of roses. There is some variation in flower size between plants grown in part shade and those given full sunshine the latter being the smaller. It appears that this plant likes at least fifty percent shade. It is evergreen and a constant grower. In California blooming has occurred from July to October though it is reported to bloom earlier in Florida. This may be due to more winter growth in the latter state whereas it is forced into relative dormancy by the cooler winter climate of the former state. [Editor's note: in California he has it in flower as late as January, 1958.]

During the past two years the writer has got together a collection of the available *Hymenocallis* species and hybrids including some as yet unidentified. This is a most interesting group of plants to work with, and it is hoped that more interest can be stimulated in cultivating these neglected native American amaryllids. Some of them are found growing in our southern states from the Ohio river southward. The evergreen types make excellent house plants, while the deciduous types can be handled as easily as gladiolus in the summer garden.

OLD WHITE CRINUM

WILLIAM LANIER HUNT, *North Carolina*

Of the many old crinums in Southern gardens, one that I like very much is a white one that blooms in late spring or early summer. It has a terrible habit of flopping over immediately after the first flower opens. In cool weather, it will remain upright for a day or so, but the scape

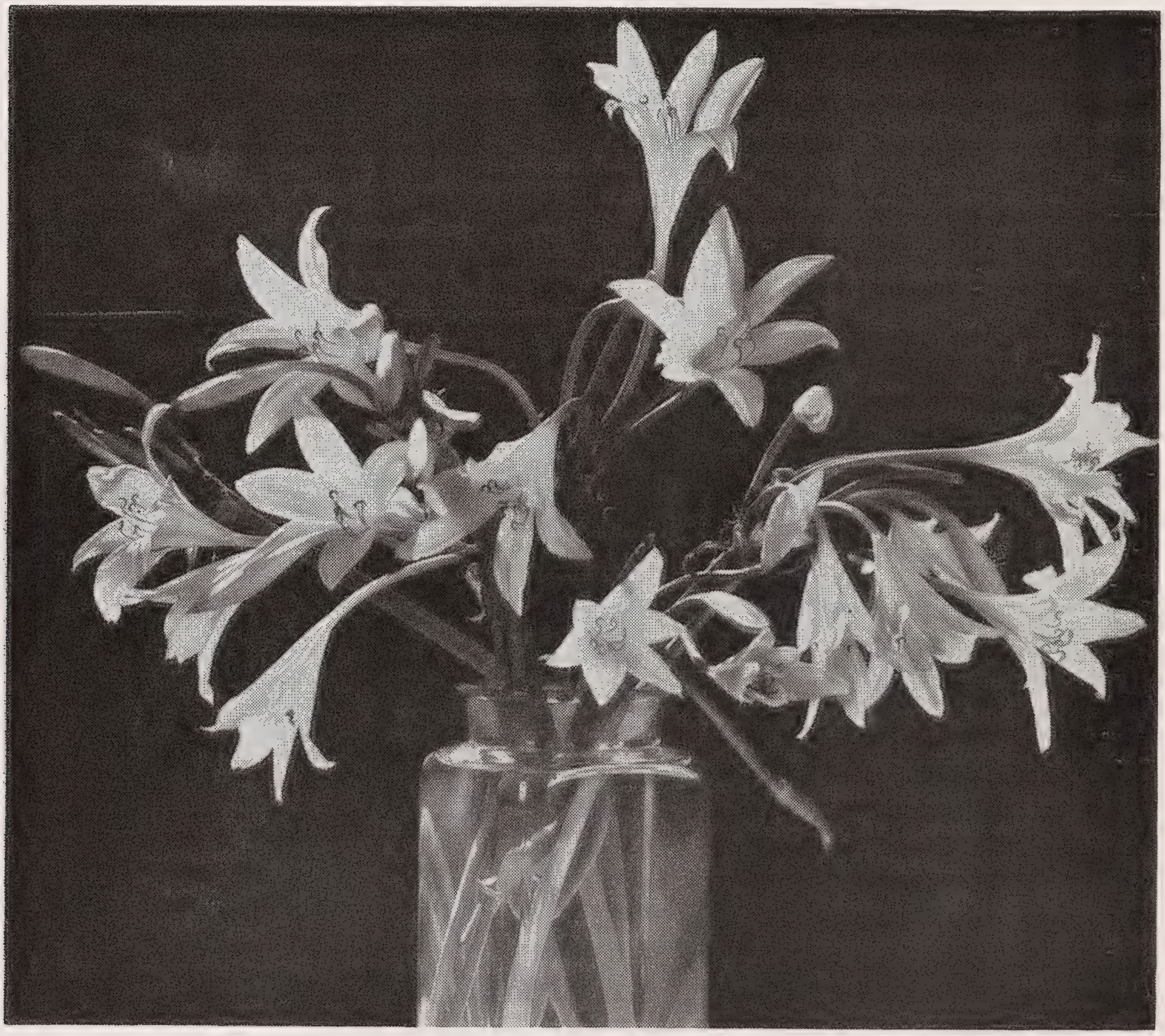

Fig. 18. An old white *Crinum of Southern Gardens.* Photo by William Lanier Hunt.

cannot hold up the long flowers and the weight of the mass, and down they go onto the ground.

This *Crinum* has all the ear marks of many other products of *C. bulbispermum,* but the flowers are pure white in warm weather. A sudden cool spell—a rare thing in late May and June in North Carolina—will put a slight suffusion of almost gray on the outside of the flowers. Again, when flowering in the fall, after a heavy feeding in September to induce this flowering, the flowers will take on this suffusion. For the most part, however, one can count on the marvelous white blossoms in early summer. The filaments are light violet, and there is a definite and decided odor of anise, different from any other crinum's odor with which I happen to be familiar. A search through the literature has not rewarded me with the mention of such a scent in crinums. For cut flowers (Fig. 18) for the house, this crinum is tops because of the subtle scent. Many others are too heavy to live with.

A handful of complete fertilizer dissolved in a bucket of water and poured around the clumps of this white crinum and watered in with the hose usually results in a new scape or two in a week to ten days. Most crinums can be induced to flower this way to prolong their blooming period.

A PRELIMINARY STUDY OF SEED SETTING IN **SPREKELIA FORMOSISSIMA** HERBERT

S. Bose and W. S. Flory, Jr.
The Blandy Experimental Farm, University of Virginia

The Aztec Lily, *Sprekelia formosissima* Herbert is a native of Mexico. Morton (1937) reports it as occurring in the states of Chihuahua, Durango, Mexico, Jalisco, Michoacan and Guerrero of that country. In addition we have collected it in Morelos, and Mrs. Morris Clint has received bulbs collected (by L. E. Guerra) in the state of Hidalgo. The states where *Sprekelia* is found are on the central plateau for the most part with elevations mostly varying between 5000 to 6500 feet and with the average May through July temperatures varying from about 68 to 78 degrees Fahrenheit.* In Mexico, D. F. and Hidalgo the elevations are greater and the temperatures are usually lower.

The Aztec Lily only seldom produces seed without hand pollination when grown outdoors in northern Virginia. Bulbs are usually stored in a warm basement (45-50° F.) during the six-month winter period and are planted outside during the latter part of April after danger from severe frosts become unlikely. Flowers are then produced rather quickly and many plants flower during the three or four weeks following bulb setting. Many plants produce flowers during the month of June, and an occasional flower appears in July. Plants allowed to grow continuously in pots in the greenhouse usually flower during late April and May.

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* From "Notes About Mexico's Climate." The Pamex Travel Club, Mexico City.

Personal communications from several persons based on experiences with growing *Sprekelia* outdoors in other parts of this country, suggest that it is not uncommon for seed capsules to be produced very infrequently especially when efforts are not directed toward seed production. It was noticed during the period from 1947 through 1954 that *Sprekelia* flowers produced in the garden never, or apparently never, developed seed capsules under natural conditions—without hand pollination. It had also been noted that a few capsules followed flowering in a cool greenhouse, especially after some hand pollinating had been done. These obesrvations have led to some simple experiments directed at throwing light on some of the factors affecting seed production in this species. Limited data bearing on the part played by artificial pollination and by temperature are reported here, and some preliminary conclusions are suggested—based on this and on the work and observations of others.

PROCEDURE

The work reported here is based on studies carried out during the 1955, 1956 and 1957 seasons. In each of these seasons observations were made on plants which carried flowers (1) as they grew in field plots; (2) as they grew in pots in the greenhouse; or (3) as they grew in pots which were placed in a warm room for 48 hours immediately following pollination.

Temperatures in the three locations varied within the following limits (in degrees Fahrenheit) during the course of the time that the reported pollinations were becoming initiated:

	Day	Night
Field		
1955	58° - 89°	50° - 65°
1956	66° - 97°	51° - 71°
1957	69° - 96°	50° - 75°
Greenhouse	68° - 95°	68° - 72°
Warm Room	80° - 90°	80° - 90°

Some additional temperature data for the plants in the field plots is summarized in Table 1.

Table 1. Temperature data summarized for the periods during which **Sprekelia** crosses were made in the field.

	Temperature in degrees F.		
	1955 June 5-28	1956 June 7 - July 8	1957 June 7 - July
Minimum			
High	65	71	75
Low	50	51	50
Mode	57	64	64
Mean	57.6	63	63.3
Maximum			
High	89	97	96
Low	58	66	69
Mode	80	89	87.5
Mean	78.2	87.2	86.8

It is apparent that very different minimum temperatures were encountered by the plants in the three different locations, although there were wide temperature ranges—especially in the field plots.

In 1955 about 35 bulbs were set in the garden. In 1956 and 1957 about 150 bulbs were available for the outdoor planting, as well as an increased number for the indoor studies, because of a generous gift of bulbs from Dr. T. W. Whitaker. Several dozen bulbs, mostly in five or six inch pots, were carried in the greenhouse each year.

Self-pollinations were made on plants in all three locations in each of the three years. Cross-pollinations were made each year of the study on plants carried in the warm room for a period.

After noticing that most flowers fail to produce capsules without hand pollination, and that only a low percentage produce capsules in the field following hand pollination—the ovaries of a few flowers of field grown plants were treated in 1955, with one per cent of naphthalene acetic acid carried in a lanolin base. This hormone treatment has not been tried out in connection with the warm room treatment.

RESULTS

A number of capsules well filled with viable seeds developed following controlled hand pollinations (Fig. 19). Our data on these are summarized in Table 2.

Table 2. **Sprekelia** self- and cross-pollinations made with numbers of seed capsules resulting—during three years, in three different locations each year.

	Self-pollinations			Cross-pollinations		
Year	Made	Capsules resulting	Per cent setting	Made	Capsules resulting	Per cent setting
			Field			
1955	16	1	6.3			
1956	26	2	7.7			
1957	52	6	11.5			
Totals	94	9	9.6			
			Greenhouse			
1955	8	2	25.0			
1956	5	1	20.0			
1957	9	2	22.2			
Totals	22	5	22.6			
			Warm Room			
1955	12	5	41.7	21	6	28.6
1956	22	10	45.5	47	16	34.0
1957	31	14	45.2	49	15	30.6
Totals	65	29	44.6	117	37	31.6

It may be noted from Table 2 that after self-pollinations the following approximate proportion of flowers matured capsules in the several locations: Field, 10%; Greenhouse, 23%; Warm Room, 45%. Cross pollinations in the warm room yielded about a 32 per cent capsule development, as may also be seen from Table 2.

It is evident from the above that, on a percentage basis, more than twice as many flowers produced seed capsules in the greenhouse as in the field. Again, about twice the proportion of flowers from plants placed in the warm room produced capsules as when plants were left in the greenhouse.

The very preliminary experiment with naphthalenacetic acid—used to see if the hormone stimulant would induce seed setting—was mentioned under procedure. In June of 1955 eight *Sprekelia* flowers were hand pollinated. The ovaries of four of these were then treated with one per cent emulsion of N. A. A. in lanolin, the other four being observed as controls. Ovaries of the four treated flowers evidenced a swelling which continued until the capsules were approximately of a mature size. Examination showed, however, that growth was due almost entirely to a thickening of the ovary wall, and that seed development was negligible or lacking. Hormone treatment has only been tried in this limited way with plants which flowered in the field.

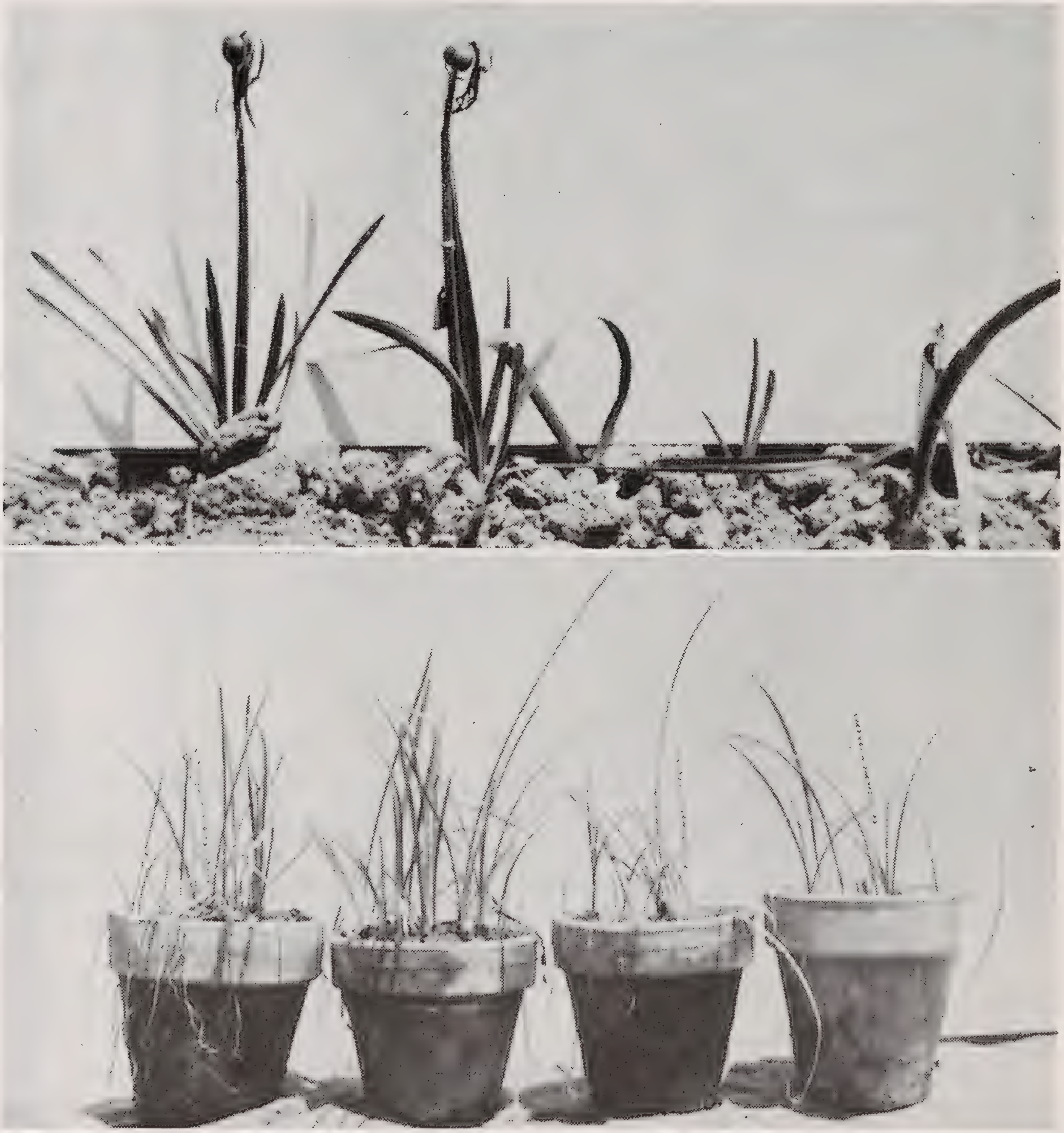

Fig. 19. *Sprekelia formosissima; upper,* two capsules nearing maturity 25 days after hand-pollination in a field plot. July 1957; *lower,* seedlings produced from 1956 seeds, July 1957. Photos by Bose & Flory.

Some information as to (1) number of seeds per capsule, (2) time required for seed development, and (3) seed germination have been compiled as a corollary to the experimental work, and will be briefly summarized below.

The 80 seed capsules produced, and recorded in Table 2, varied from 50 to 65 in number of seeds per capsule. The 80 capsules produced a total of 4526 plump seed—an average of almost 57 seeds per capsule.

The capsules produced in 1957 matured in from 26 to 31 days—and averaged 29 days from pollination to seed maturity.

The majority of seed planted germinate quickly and give sturdy seedlings (Fig. 19). Something over 300 seedlings are now being used in cytological studies. The five lots of seed planted most recently totalled 173 seed. From these 105 seedlings have been secured, a germination rate of about 61 per cent. Quite often a near 100 per cent seed germination results.

DISCUSSION

Sprekelia seldom produces seed without hand pollination, within our observation. Rex Pearce in 1934 had mentioned that this taxon will seed freely if hand pollinated. Our observations confirm Pearce's in general. We have found seed to be produced much more readily—following hand pollination—in warmer locations.

Minimum temperatures were consistently lowest in our field plots (where fewest capsules were set) and highest in the room (where most capsules developed), with the greenhouse being intermediate with respect to both minimum temperatures and proportion of capsules produced.

Smith and Cochran (1935) working with tomatoes *(Lycopersicon esculentum* Mill.) found that temperature has a marked effect (1) on the germination percentage of pollen (with maximum germination at 50° F., 60 hours after pollination, being 21.5 per cent; at 100°—at the end of 42 hours—being only 6.3 per cent; while at 85°—after 60 hours—maximum was 66 per cent and with the germination percentage being almost as high at 70° as at 85°) and (2) on pollen tube growth (with maximum growth rate being at 70° F., with that at 85°, 50° and 100° ranging in decreasing order.)

Work reported here indicates a definite correlation between high temperatures and increased proportion of seed capsule development. While we have no data concerning effect of temperatures directly on pollen germination and pollen tube growth with *Sprekelia*, it seems likely that stimulation of pollen germination and tube growth may be the factors responsible for our results. Our *Sprekelia* flowers have not been exposed to temperatures likely to be inhibiting by their highness.

This study has shown that hand pollination, and minimum temperatures higher than those commonly encountered in the early summer outside in northern Virginia, are both factors favoring seed capsule development. There are doubtless other environmental as well as genetical factors that have definite effects on capsule development. Photoperiod, soil moisture, and humidity are doubtless among the pertinent environmental factors. One of us (Bose) is making a detailed cytological study of *Sprekelia* and is finding that in addition to the usual high number of somatic chromosomes, that there are lines with at least two different lower somatic chromosome numbers. These results will be published in a separate report. It is likely that such varying chromosome numbers may have effects on the results from either or both self- and cross-pollinations. It is possible, too, that compatibility factors—as well as other genetic influences—may effect capsule development and seed production. All these possible effects, of course, would be in addition to those produced by hand pollination and by temperature factors.

It may be noted from Table 2 that a lower percentage of capsules developed following cross-pollination, then after self-pollination. While we might speculate on the reason for this we have no satisfactory explanation concerning this fact at the present time.

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NEW DISEASE OF AMARYLLIS BULBS—INTERIOR BLACK ROT

Mr. John E. Davis of Salem, Oregon, reported a new disease of *Amaryllis* bulbs—Interior Black Rot. This came too late for inclusion in the writer's forthcoming book, "THE AMARYLLIS MANUAL". Every effort will be made to obtain basic information about this disease so that an efficient method of control may be worked out. Progress reports will appear in future issues of HERBERTIA.—*Hamilton P. Traub*

[CALDWELL, LYCORIS HYBRIDIZING—continued from page 68.]

various species made it convenient. However, it should be possible to keep pollen viable for several weeks in cool, dry storage, and I plan to use that method to make some new crosses in 1958. For such help as it may give other lycoris fanciers, here is the record on my attempts at lycoris breeding:

L. radiata X *L. sprengeri* and the reverse cross, *L. sprengeri* X *L. radiata*—Both of these "take" nearly every time. I have numerous seedlings coming along. These could be very valuable, not only for the interesting possibilities in color and flower form, but also for the extra hardiness they might inherit from *L. sprengeri.* Red "radiata type" flowers on bulbs hardy enough to thrive well up into the North are just one of the possibilities.

L. radiata X *L. haywardii*—this cross produced good seed on my first attempt, the past season (1957).

L. radiata X *L. houdyshelii*—Most attempts have failed completely. I have a few seedlings from this cross but fear they may be from addidental selfing of the parent, *L. radiata.*

L. radiata X *L. caldwellii*—As with the *L. houdyshelii* cross, this has failed in nearly every attempt. Seeds developed one time, but again, may have resulted from accidental selfing of the seed parent.

One or more attempts have been made at the following crosses, and all have failed: (1) *L. haywardii* X *L. squamigera,* and the reverse, (2) *L. radiata* X *L. squamigera*, and the reverse, (3) *L. radiata* X *L. incarnata,* and the reverse, (4) *L. incarnata* X *L. squamigera,* and the reverse, (5) *L. sprengeri* X *L. incarnata,* and the reverse, (6) *L. sprengeri* X *L. houdyshelii,* and the reverse, and (7) *L. sprengeri* X *L. caldwellii, and the reverse.*

These failures do not prove necessarily that similar crosses might not succeed in other cases, under other growing conditions. The seeding habit of lycoris species apparently is somewhat erratic. A California correspondent planted bulbs of the same fertile strain of *L. radiata* that I have. He wrote me that they bloomed, all right, but did not set seed. Here in Tennessee they always have a good crop. We'll have to learn a lot about these plants simply by experiment.

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GENERAL EDITION

EDITED BY
HAMILTON P. TRAUB
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THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California

PREFACE

This general edition of PLANT LIFE is noteworthy for the report on the introduction of the ACHOCHA, the CORNUCOPIA CUCUMBER, by Mrs. Marianna Evans Applegate from Bolivia. This promises to become an outstanding new vegetable crop for the United States, but the exact range where it can be grown has yet to be determined.

In addition there are articles on native Shellflowers by Dr. Howard, and a report by Dr. Corliss on his 1957 European tour, particularly concerning nematode control in bulbs, and the growing of bulbs in Italy by Holland growers in order to advance flower formation. Dr. Uphof begins his series of articles on the genus GAGEA.

March 15, 1958,
Camino de la Costa,
La Jolla, California.

Hamilton P. Traub
Harold N. Moldenke

[PLANT LIFE LIBRARY—continued from page 56.]

A GLOSSARY OF MYCOLOGY, by W. H. Snell and Esther A. Dick. Harvard University Press, Cambridge, Mass. 1957. Pp. 171. Illus. $5.00. In this important new book an attempt has been made to include as many as possible of mycological terms and other terms useful to students of mycology. The illustrations are by Henry A. C. Jackson. This excellent reference work fills a definite need and will be welcomed by all biologists. Highly recommended.

INTRODUCTORY PLANT SCIENCE, 2nd ed., by H. T. Northen. Ronald Press, 15 E. 26th St., New York 10, N. Y. 1958. Pp. 718. Illus. $6.75. This second edition of an outstanding text of botany "presents the beginning student with a realistic and challenging introduction to plant science" so as to make it "a memorable experience." It is written in the author's usual clear and easily readable style and is highly recommended.

GENERAL BIOCHEMISTRY, 2nd ed., by J. S. Fruton. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1958. Pp. 1077. Illus. $18.00. This second edition of an outstanding text "offers an introduction to the subject for qualified college seniors, students of medicine, post doctoral research students in the biological sciences and chemistry. Due to rapid progress in this subject, most of the chapters have been revised, and one new chapter has been added. Highly recommended.

TOPICS IN MICROBIAL CHEMISTRY, by F. M. Strong. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1958. Pp. 166. Illus. $5.00. The subjects covered in this stimulating book include antimycin, coenzyme A, kinetin and kinnins which are obtainable from microorganisms and are physiologically active at very great dilutions. The main objective is to show how the use of certain experimental techniques contributed to progress in these fields. Highly recommended.

THE PRINCIPLES OF HEREDITY, 5th ed., by L. H. Snyder and P. R. David. D. C. Heath & Co., 285 Columbus Av., Boston 16, Mass. 1957. Pp. 507. Illus. This 5th edition of an outstanding text is designed "to acquaint the beginning student of heredity with the facts and principles of inheritance" and "to arouse and hold the interest of the student and stimulate his thinking." The various chapters have been thoroughly revised, and the book has been brought up-to-date by the addition of a chapter on the genetics of bacteria and viruses. This stimulating text is highly recommended.

ACHOCHA, THE CORNUCOPIA CUCUMBER

HAMILTON P. TRAUB

In 1955, Mrs. D. V. (née Marianna Evans) Applegate of Monona Plantation, Ferriday, Louisiana, and Santa Cruz, Bolivia, brought back seeds of ACHOCHA, and distributed it to a number of gardeners. This belongs to the CUCUMBER family. The fruits were successfully grown in Baton Rouge, Lafayette and New Orleans in Louisiana and by Eugene T. Du Pont of Laguna Beach, Calif. The only complaint received about the plant by Mrs. Applegate is that ''it tends to take over the place''. According to Mrs. Applegate, ''this is no problem in the garden, and in frost-free areas, one vine would keep a family in large edible fruits the year round.''

Mrs. Applegate writes that the word, ACHOCHA, is probably an Amerindian name. She states that this fruit was not observed growing in the wild; that ''it is the most common fruit—to be used as a vegetable—that is offered in the markets in Santa Cruz, Bolivia. A half bushel would cost a few cents in U. S. money. It does not grow in the Cochabamba area, and when it is brought into the Cochabamba market, it is considered quite a delicacy, and is comparatively expensive. It has not been seen growing in La Paz, Lima and Arequipa.

We are indebted to Dr. Oscar Clarke, of the University of California at Riverside who furnished the information about the scientific name of this plant to Mr. Eugene T. Du Pont who passed it on to us. It is as follows:

''*Cyclanthera pedata* var. *edulis* in Engl. & Prantl, Nat. Pflanzenfam. 4: abtlg. 3b-5. A variety with large edible fruits cultivated in Peru and Bolivia.''

According to Index Kewensis, the original taxon under the name *Cyclanthera pedata* Schrad. was published in Ind. Sem. Hort. Goett. 1831; cf. Linnaea 8: litt. 23, 1833. This is native to Mexico, and after the publication of var. *edulis* becomes automatically, under the Int. Code, *C. pedata* var. *pedata*. The oblong fruit is covered with soft prickles; the plant is perennial, and is known as the CLIMBING CUCUMBER.

PLANT DESCRIPTION

Eugene T. Du Pont, of Laguna Beach, Calif., the well-known artist and plantsman, who is responsible for the wonderful series in color, THE ROMANCE OF FLOWERS, writes that the seeds were obtained from Mrs. Marianna Applegate, and were

''planted in the spring of 1957 in a fairly sunny spot. Every seed planted sprouted within a week or two and grew very fast. Water was freely given, and a few applications of complete fertilizer, and manure, were made. The stems branched freely and rambled over everything—

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some reaching to 30 feet. The leaves are very decorative, light green, many measuring 6 to 8 inches across. Flowers began to appear in June. Male flowers were borne in clusters on long stems arising from the leaf axils, and the female flowers were borne singly right in the axils. Both kinds are very small, under ¼ inch wide. The early bloom set no fruit, and it was noted that no pollen carrying insects were present. In July and August many small butterflies and bees became active pollen bearers and the fruits began to set. The plants began to die back in November. The roots seem to be dying back too, so probably it is an annual, but a few will be left in the ground to check this point.''

CULTURAL RANGE

The full cultural range of Achocha is not known at present. It thrives in Louisiana and therefore should also be at home in the rest of the lower South. Mr. Du Pont has shown that it is adapted to southern California. Its adaptability as a summer growing cucurbit in the North has yet to be demonstrated.

THE FRUITS AND SEEDS (Fig. 20)

Mr. Du Pont sent Achocha fruits to the writer in December 1957. These are most interesting. They are glaborous (smooth) on the outside, but Mr. Du Pont writes that ''the fruits on one vine had weak spines on the surface, about ⅛ to ¼-inch long and very thin. They were prickly looking but not to the touch.''

The following description was made from fruits furnished by Mr. Du Pont. The color varies from sap green (HCC 62/2) to lettuce green (861/1) with somewhat deeper green veins running lengthwise of the fruit. The fruits are hollow with a rind about 3/16 inch in thickness. In shape they are shortly necked and the balance of the fruit is cornucopia-shaped, 6¾ to 7¾ inches long. The short neck which is hollow only for half its length is ¾ to 1 inch in diameter. From the neck the fruit enlarges abruptly to 2 to 2½ inches in width, then tapers gradually to a pointed apex which is curved as is shown in Fig. 20. Thus the common name, Cornucopia Cucumber, is apt. A strand, about ¾ as long as the fruit, grows in the hollow fruit from the apical end. It is attached for about half its length to the rind; the seeds are borne on the remaining free portion. The seeds are black and resemble a turtle with its head extended from its carapace. They are 7/16 inch (1.1 cm.) wide, 9/16 inch (1.5 cm.) long, and almost 3/16 (4 mm.) thick. The surface of the carapace-like part is provided with three ridges at the edges of both sides; and pointed upraised projections are found between the upraised ridges; the apex resembles a turtle's head.

On the basis of the fruit shape which resembles a cornucopia, the common name Cornucopia Cucumber has been adopted.

RECIPES

Under date of January 29, Mrs. Applegate writes that Achocha is a delicious food that may be prepared in several ways; *broiled, stuffed* and in *stews* and *soups:*

"The fruit is washed, seeds removed, cut into strips lengthwise, and boiled no longer than 15 minutes. It is drained and garnished with grated cheese;

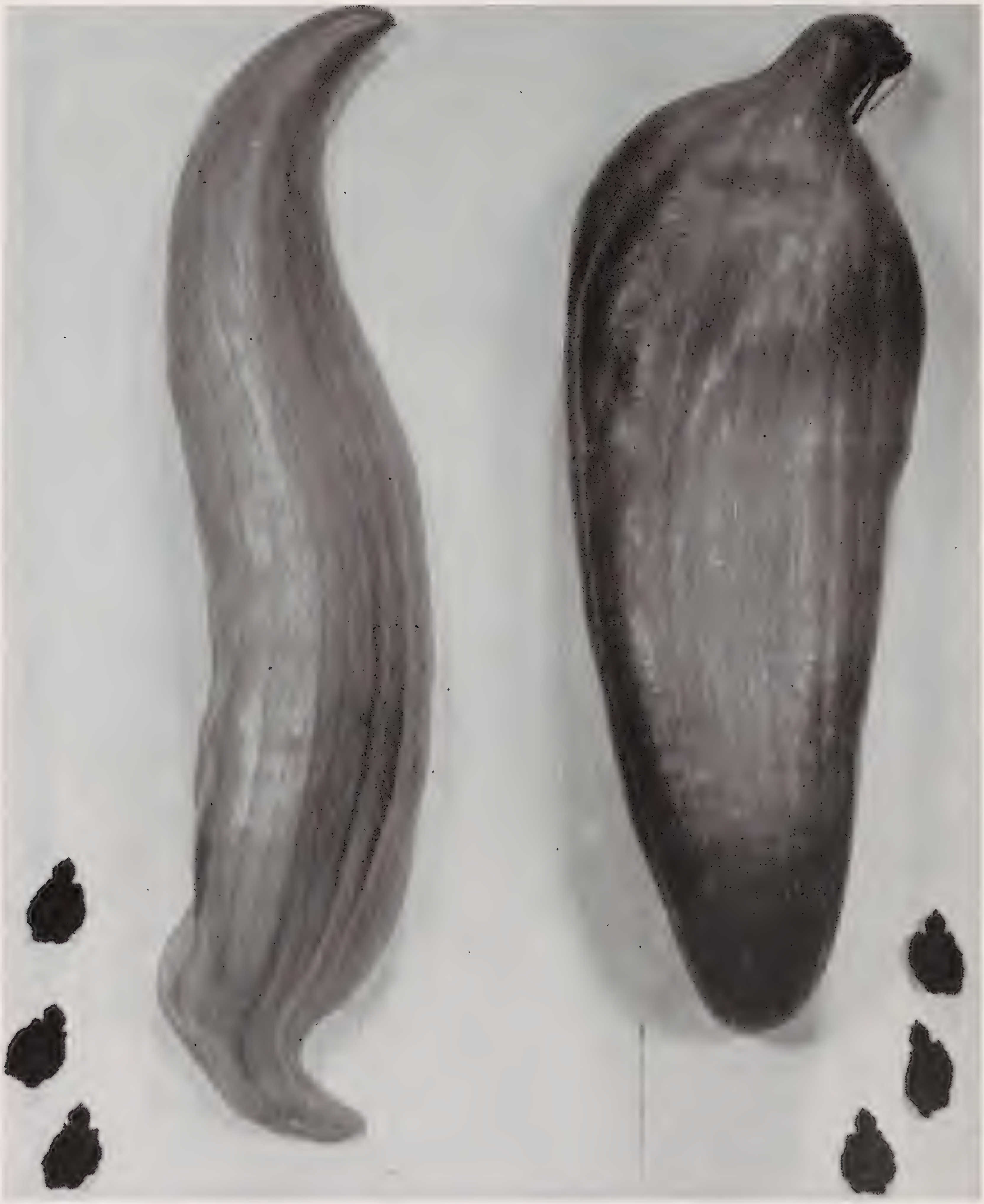

Fig. 20. Fruits and seeds of ACHOCHA, the CORNUCOPIA CUCUMBER. Note that seeds are turtle-shaped. Photo by G. A. Sanderson.

"again, the fruit is prepared as above, boiled for only 5 minutes, chilled and served as a salad with sauce vinagrette.

"The top of the fruit is cut from the fruit, seeds removed, scalded, and stuffed with one's favorite stuffing, making use of left over meats, fish or poultry. The stuffed fruits are baked in a shallow pan, and one's favorite tomato or mushroom sauce is poured over them. This makes a delightful main course.

"Achocha adds a bit of zest to both vegetable soups and stews; it is added to these about 15 minutes before serving time."

We are grateful to Mrs. Applegate for these recipes. When the fruits were received from Mr. Du Pont in December, the information furnished by Mrs. Applegate had not been received. The writer turned over the fruits to his sister, Mrs. Raymond Young, who prepared them for the table: (a) BROILED AND STEWED CORNUCOPIA, by broiling in a manner similar to that suggested by Mrs. Applegate above, and (b) CORNUCOPIA SALAD, by shredding and serving uncooked as a green salad, mixed with other ingredients such as lettuce, cabbage and so on. Both of these dishes are delicious.

OTHER USES. Undoubtedly other ways of preparing the CORNUCOPIA CUCUMBER will be developed by imaginative cooks, particularly the immature fruit. It may also be used in floral decorations, particularly for Thanksgiving Day. It is evident that the CORNUCOPIA CUCUMBER will become a very popular vegetable in the United States. Apparently the fruits are durable enough so that they can be shipped. They have been stored in the refrigerator for a considerable time.

NATIVE SHELLFLOWERS

THAD. M. HOWARD, *D. V. M., Texas*

For lack of a better name, SHELLFLOWER is a term loosely applied to various Irids that share certain peculiar characteristics with one another, such as pleated foliage, and delicate short lasting flowers of unusual form and beauty. Perhaps the best known of these is the colorful *Tigridia pavonia.* Few people are aware that the gaudy *Tigridia* is but one of a large tribe that includes many rare and fascinating little floral gems that grow almost beneath our noses along the coastal plains and prairies of the lower south and south west sections of the United States.

Early botanists must have been impressed with the structure of the styles of these plants, because many of the genera bear such names as *Nemastylis, Salpingostylis, Eustylis,* and *Chlamydostylis.* None of these names could be termed pretty, and this may be one reason why they may never become household words among average gardeners. The real reason for their lack of popularity is that many of them are quite rare, and also the flowers of some are of such short duration, that they are easily overlooked by the casual eye. A few, such as *Nemastylis geminiflora* are widespread, and commoner than most people realize. When one finds them mentioned in horticultural literature, they are all spoken of as growing from corms, but this writer has yet to find a cormous *Tigridia, Nemastylis, Herbertia, Eustylis,* or *Cypella.* Perhaps some species do have corms, but it is ridiculous to keep perpetrating such an error in literature without at least examining the bulbs of these plants. Anyone who recognizes a true bulb by its tunicated separate sheaths will know that these Irids possess true bulbs, rather similar to Dutch Iris.

Commonly called CELESTIAL LILY, *Nemastylis geminiflora* (Fig. 21) differs from most of its other SHELLFLOWER Irid relatives in that the flower segments are all relatively similar in size and shape, while other members of the group usually possess a floral structure of contrasting proportions. At first glance, CELESTIAL LILIES may appear to resemble a giant *Sisyrinchium;* however the texture of the flowers is far more delicately fragile. When the sun shines on them early in the morning, the succulently satin sheen of the frosty blue color fairly sparkles. Indeed, the blueness of these flowers is perhaps their most outstanding virtue. It might be pointed out here that it would be misleading to imply that all flowers are a rich deep blue, for, like all of natures flowers, there is considerable variation in hue from one flower to the next. Some flowers are palest blue, while others approach purple, but the majority are quite blue.

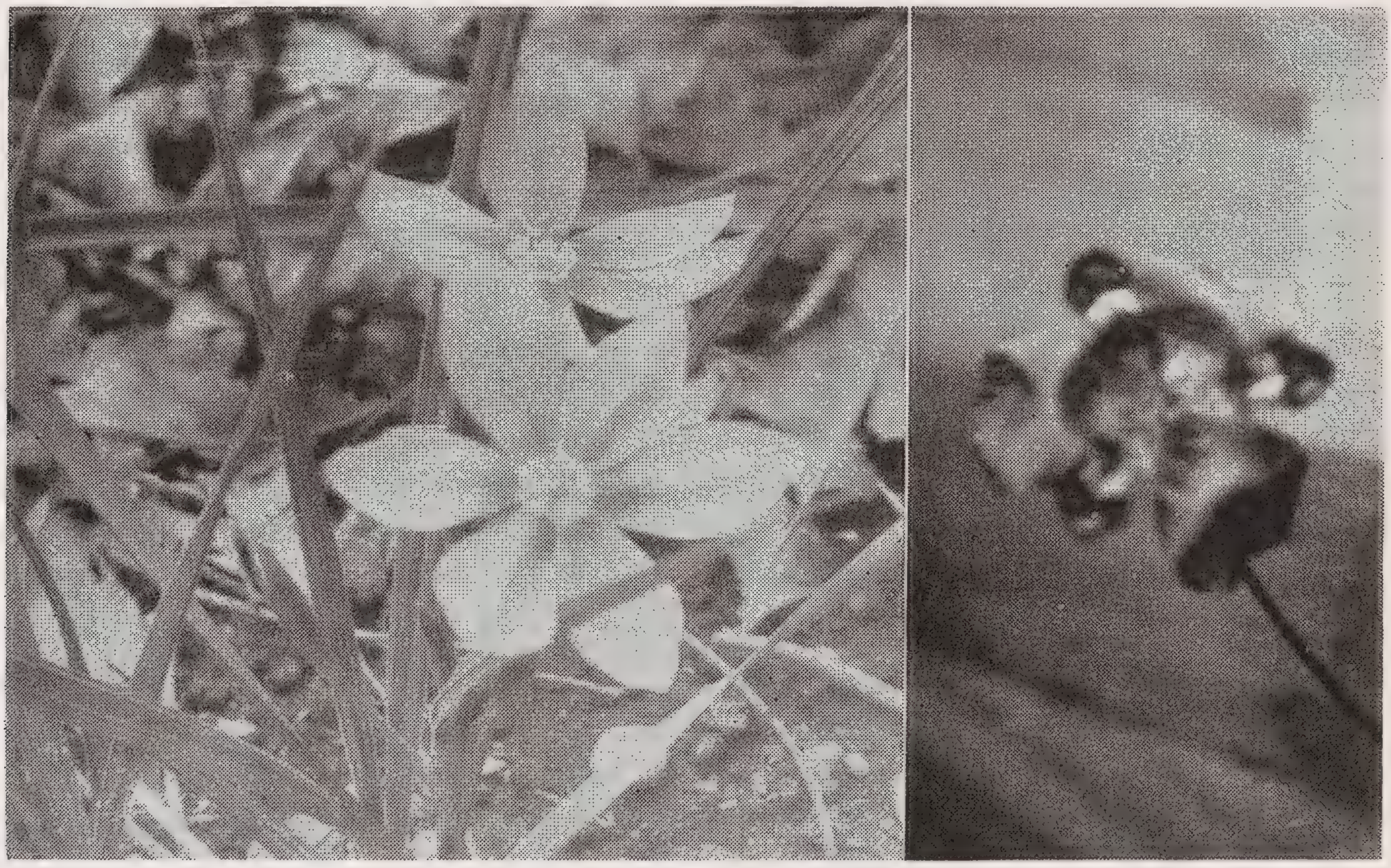

Fig. 21. Native Shellflowers: *left, Nemastylis geminiflora; right, Eustylis purpurea.* Photos by Dr. Thad M. Howard.

1. **Nemastylis geminiflora** Nutt.
(Syn.—**N. acuta** (Bart.) Herb.)

These fragile blossoms are of good size, when compared with the usual fare of the so-called ''minor'' spring-flowering bulbs, being 2-3″ across the face, and prominently accentuated by bright yellow anthers which curl in the white center of the flower. Although the individual flower closes during the heat of the day, a well grown plant may produce as many as a dozen blooms in one season. The thin wiry stem branches somewhat, with each branch terminating in a green spathe from which arise two flowers in succession. The 8″ stem barely overlooks the narrow pleated grass-like foliage.

The culture of CELESTIAL LILIES is relatively easy. They desire an open, sunny location in soil that is well-drained and fairly heavy and neutral to alkaline in pH reaction. Very thin sandy soils and too much acidity are not to their liking. Once planted they may be left undisturbed forever, since they rarely will ever form offsets, and will never become crowded. Furthermore, one need not be too concerned about proper planting depths, since they will quickly adjust themselves to their own preferred depth with the aid of their strong contractile roots, until they may eventually pull themselves down to a foot or so. This habit has discouraged many a bulb collector from ever digging many bulbs in the wild, for digging a small bulb growing six to twelve inches deep in heavy black soil is not a task for the weak muscled gardener. It is an athletically ambitious undertaking.

CELESTIAL LILIES should prove to be hardy in our more northerly climates since it can be planted deeply enough to escape most cold damage. They are probably the hardiest of the shell flower clan, and once happily situated, they can be forgotten.

Like many other members of this group, CELESTIAL LILIES practically never increase by offsets; however, it is an easy task to acquire a good supply of them in a short time from the freely produced small brown seeds. These seeds can be planted in the fall; will germinate in early spring and bloom the third year after planting. The dark-skinned bulbs of CELESTIAL LILIES are always covered by many layers of old tunics that seemingly never rot. This thick husk overcoat belies the size of the bulb, and may give one the impression that the bulb has shriveled, but ’tain’t so. If these husks are removed, it will be found that the bulb is really much smaller than it first appeared to be, and that it is not a flabby or shriveled dead thing, but quite firm and alive.

While *Nemastylis geminiflora* is perhaps the most common species to be found in Texas, another very similar species, *Nemastylis tenuis* (Herb.) Benth. & Hook., is found along the coastal and Rio Grande plains in the southern part of the State. There is also another related form, *N. tenuis* var. *pringlei* (S. Wats.) R. C. Foster, that occurs in the mountains of southwest Texas and the State of Chihuahua, Mexico. *N. brunnea* Wats., is also listed from Mexico.

Not long ago, a new species of *Nemastylis, N. floridana,* was discovered in the northeastern coastal region of Florida. It is described as bearing violet-blue flowers, with the same ephemeral habits as other members of this genus. It differs most notably from our common *Nemastylis* in that it blooms in the fall, from mid-afternoon till dusk, while our spring blooming species flower in the forenoon. The range of this plant is restricted, being confined to marshes, swamps, and flatwoods of northeastern Florida. In contrast, *N. geminiflora* is widespread, being listed from Texas, Missouri, Louisiana, Kansas, Arkansas, and Tennessee.

Actually, *Nemastylis* is a genus that contains but a relatively few known species in the United States, and is characterized by having the filaments nearly free. However, Baker, in his HANDBOOK OF THE IRIDAE, includes *Chlamydostylis* as a subgenus of some 17 species found from Mexico to South America, and characterized by having the filaments united in a column to the summit. *Eustylis purpurea,* a plant that is closely related to the *Nemastylis,* is sometimes listed as *N. purpurea* by some botanists. This is a very distinctive plant, and the flowers in no way grossly resemble the usual *Nemastylis.*

The genus *Eustylis* is not recognized by all botanists (its type was originally described as a species of *Nemastylis),* but that this is a matter of opinion. To the average layman, *Eustylis* and *Nemastylis* are much too different to be considered in the same genus, but with some botanists it may be another matter. Certainly these two plants do not look alike.

Another plant that has been confused with *Nemastylis* is the very rare BARTRAMS IXIA *Salpingostylis coelestina.* This is a very closely related monotypic genus confined to a small area southwest of Jacksonville, Florida. In the 1950 edition of HERBERTIA, Wyndham Hayward wrote a very enlightening article about this little-known plant. The foliage is longer than that of *Nemastylis geminiflora* and the flower is distinguished by possessing a long, pendant, trumpet-like style, and more broadly ovate perianth lobes. A flower to be enjoyed only by the early morning risers, they are said to be called ''violets'' by local folks.

2. **Herbertia drummondiana** Herb.

(Syn.—**H. coreulea** Herb.; **H.** watsonii Baker; **Alophia drummondii** (Graham) R. C. Foster; **Trifurcia** Herb.)

Although *Herbertia drummondiana* has many synonyms, it is sometimes called ''pleated leaf Iris'', or more simply, herbertia. In 1827, it was christened *Herbertia* by Sweet. Later, in 1838, Herbert named it *Alophia;* again in 1840, Herbert called it *Trifurcia,* thereby giving rise to much confusion as to the generic name of this little bulbous Irid. The genus is said to be found from Texas to Chile and southern Brazil, but the form that we are concerned with is native to the coastal plains of Louisiana and Texas.

This species is fairly widespread, but like *Nemastylis,* it is not well known even in its own locale. Only two flowers are produced from the terminal spathe in early spring, but they are little dandies, resembling somewhat a tiny violet-blue Tigridia. The sepals are usually pale violet with a darker violet band outlining the white base, which is violet spotted. The petals are light violet in the upper part becoming a darker violet below and white spotted at the base. There are only a few leaves, and these are long and slender, rather folded or plicate. The flowers are about 2″ across, and like tigridia, the three center segments are quite small, but the three larger segments are prominent enough to command attention. Like so many Irids, *Herbertia* fits into that group of flowers loosely termed ''orchid-like'' because of the appearance suggested.

Herbertias may be easily propagated by seed as they don't usually form any offsets. Like CELESTIAL LILIES, the bulbs are buried deeply in the ground and are hard to dig. They seem to like the heavy type of soil that will grow CELESTIAL LILIES to perfection, but prefer instead a neutral to mildly acid pH. They should prove to be practically as hardy as CELESTIAL LILIES because of their deeply seated bulbs and their emergence following warm spring days.

Herbertia watsonii Baker may be only a form of *H. drummondiana.* It is said to be different in that the outer segments are oblanceolate, 1″, and the inner segments obovate, ½″ long, however some botanists regard *H. watsonii* as no more than a synonym of the species.

3. **Eustylis purpurea** Small
(Syn.—**Nemastylis purpurea** Herb.)

One of the most exciting members of this group, *Eustylis purpurea* (Fig. 21) is noteworthy for being perhaps the loveliest of the entire clan. One might simply describe it as being very much like a miniature violet-purple *Tigridia.* Describing this flower is no easy task, since the soft hues, delicate dotting of the cup, and striking shape of the blossom in general, makes one realize how difficult it can be to attempt to transfer nature's artistic achievements into mere word pictures. Because of the subtle violet hues, it is no gaudy flower, but it captures the imagination as though to say ''stay awhile and look at me''. Truly one must study this flower in order to fully appreciate one of nature's floral triumphs.

Sometime in mid-spring, the palm-like pleated foliage begins to emerge from the sandy loam of its native habitat, and before long the wiry stem branches and terminates into several pointed spathes, from which emerge the flowers for several days in succession. They may attain a height of eighteen inches and bloom many times before the seeds ripen in early summer. Since it shares foliage, flowers and habits very similar to tigridia, it should be handled in much the same way. It should probably be classed as half-hardy, since it is a native of the U. S., and can likely stand considerably more cold than tigridias.

The slightly nodding 2″ flower may be described as having three large outer segments and three smaller inner segments, the larger segments forming a cup-like depression at the center of the blossom. This cup has a pale greenish-tan background spotted lightly with purplish-brown dots. Beyond the cup, the three segments flare into broad, violet or purple bits of color. The three small inner segments add the dramatic finishing touches to the flower. Each inner segment is colored the same as the cup at the center, but slightly more than midway past the outer half of the segment, a broad band of yellow crosses transversely. The yellow band terminates in another band of deep purple at the tip of the segment. This little purple tip also has a tiny cup-like depression.

Describing such a flower is difficult, and truly one must see it and study it to fully appreciate it.

Unlike *Herbertia* and *Nemastylis,* the bulbs of *Eustylis* are buried only a few inches below the soil surface in light sandy loam of a mildly acid nature in lightly shaded wooded areas in Louisiana, East Texas, and the Texas coastal prairies. It seems to like adequate moisture while growing, being at its best in cool wooded areas where there is enough filtered sunlight to make it happy, though it also seems to do very well in full sun. In Louisiana it is sometimes called PINE WOODS LILY according to Caroline Dorman. In keeping with other members of this group, *Eustylis* is propagated by seed.

During the war years or the mid-forties, an article appeared in the now extinct magazine HOME GARDENING FOR THE SOUTH, written by the late Ruth Marsalis Dorman, entitled ''Three Little Cousins''. This charming little article was devoted to the three little Irids, *Nemastylis, Herbertia,* and *Eustylis,* that Ruth Dorman knew so well in Louisiana. It was illustrated with sketches by Caroline Dorman through the courtesy of the LOUISIANA DEPARTMENT OF CONSERVATION. To quote from Ruth Dorman's article regarding *Eustylis;* ''This little flower has a bit of romantic history. It was ''lost'' for many years. Caroline Dorman had known it from childhood. When she grew older and became seriously interested in botany, she searched all available literature on plant taxonomy, but could not find a trace of her little friend's scientific name. When she had about given up, Dr. John K. Small came to her place on a botanical expedition, and she called his attention to it. He had never seen it! She gave him plants, and, later, he looked it up in old files of botanical journals. There he found it had been named and described by Asa Gray. Although ''lost'' to science, it had been giving its beauty unstintedly each summer to those who loved it as PINE-WOODS-LILY.''

4. Other Shellflowers

A few years ago, Mr. and Mrs. Morris Clint of Brownsville, Texas, collected another of this group of miniature bulb Irids in the Puerto de los Lobos region in the State of San Luis Potosi, Mexico. As far as I know, it has not yet been identified. It is rather like a tiny white *Nemastylis* in form, but has broad pleated foliage like a dwarf TIGRIDIA. They found it growing with *Zephyranthes Clintiae,* in full sun and part shade all over the mountains along Highway 80, in San Luis Potosi. This little Irid flowers in the summer and early fall with tiny white, mildly fragrant flowers opening in the late afternoon and early evening. It produces seeds freely and seedlings seem to grow vigorously and may flower when only a year old. Though not showy, they are so dainty and unusual that perhaps they may some day find their way into the gardens of folks who appreciate such rare floral gems. Let us hope so.

There are so many species of bulbous Irids in Mexico that it will be years before many of them will be mentioned in books about rare bulbs. While traveling through Central and Southern Mexico in mid-summer of

1957, I found several unknown species in bloom. I managed to collect a few, which later grew and flowered in my garden, but no doubt there are many others yet to be found.

One species in this collection was a tiny little lavender-flowered *Nemastylis* with narrow, grassy foliage, I also collected bulbs of two distinct *Herbertia*-like Irids, one purple and the other lavender-pink. The former grew on small mountain sides, near Morelia, in Michoacan, while the little lavender pink one grew in the rolling prairies west of Toluca, in the State of Toluca. I found a pleated leafed species that was much like *Tigridia* until it flowered, and then it was unlike any other Irid that I have ever seen. Though neither large nor showy, the flower was easily fantastic in color and form. The three outer segments were yellow with maroon-brown spots, while the three inner segments were white with the same spots, and edged yellow at the blunted tips. The three larger outer segments rolled inward so that the ultimate form of the flower was that of a pendant little balloon-like bell, suggesting a *Fritillaria.* The three inner segments were banded with a little cream-colored band that seemed to function as a gland, and forming a perfect triangular band within the flower. This little triangular band became very dewy after the flower opened. I have no idea what genus this Irid belonged to, but it certainly is one of the oddest members of this group.

There are many other species of SHELLFLOWERS that have not been mentioned, but most of these are to be found south of the United States border. Many stunning species of *Tigridia* are to be found in Mexico, flowering in warm, damp, lightly shaded hillsides in the upper altitudes. *Tigridia pavonia* is perhaps the best known species, but other species have also played a vital part in furnishing the germ-plasm lines that enabled the hybridizer to produce such a brilliant array of colors. There is not much need to mention them at any length in this article, since they are already established as relatively popular summer-flowering bulbs in the trade. The same applies to a lesser extent with the *Cypellas,* the golden-buff *Cypella herbertii,* and the violet *C. plumbea,* which are occasionally to be found among collections of rare bulbs.

Tigridias are generally available in most catalogs that list the usual fare of summer flowering bulbs, but one must search very carefully through catalogs listing unusual bulbs to find even a few lesser-known SHELLFLOWER. A few prominent horticulturists such as Wyndham Hayward, James Giridlian, and Rex Pearce occasionally list some of them in their catalogs from time to time.

HOLLAND NOTEBOOK

PHILIP G. CORLISS, *M.D.*
Somerton, Arizona

From the notes made on my 1957 Fall Garden Tour of Europe I have selected the following items concerning horticulture in Holland which should be of interest to some members of The American Plant Life Society.

(1) The government of The Netherlands insists that employment be given to males whenever possible. This may be a sensible approach to the problem of juvenile delinquency. Whatever the reason, there are only nine women employed in the Netherlands properties of the great K. & M. concern. Some of the Dutch firms now have operations in other countries, notably Denmark, where they can employ women freely.

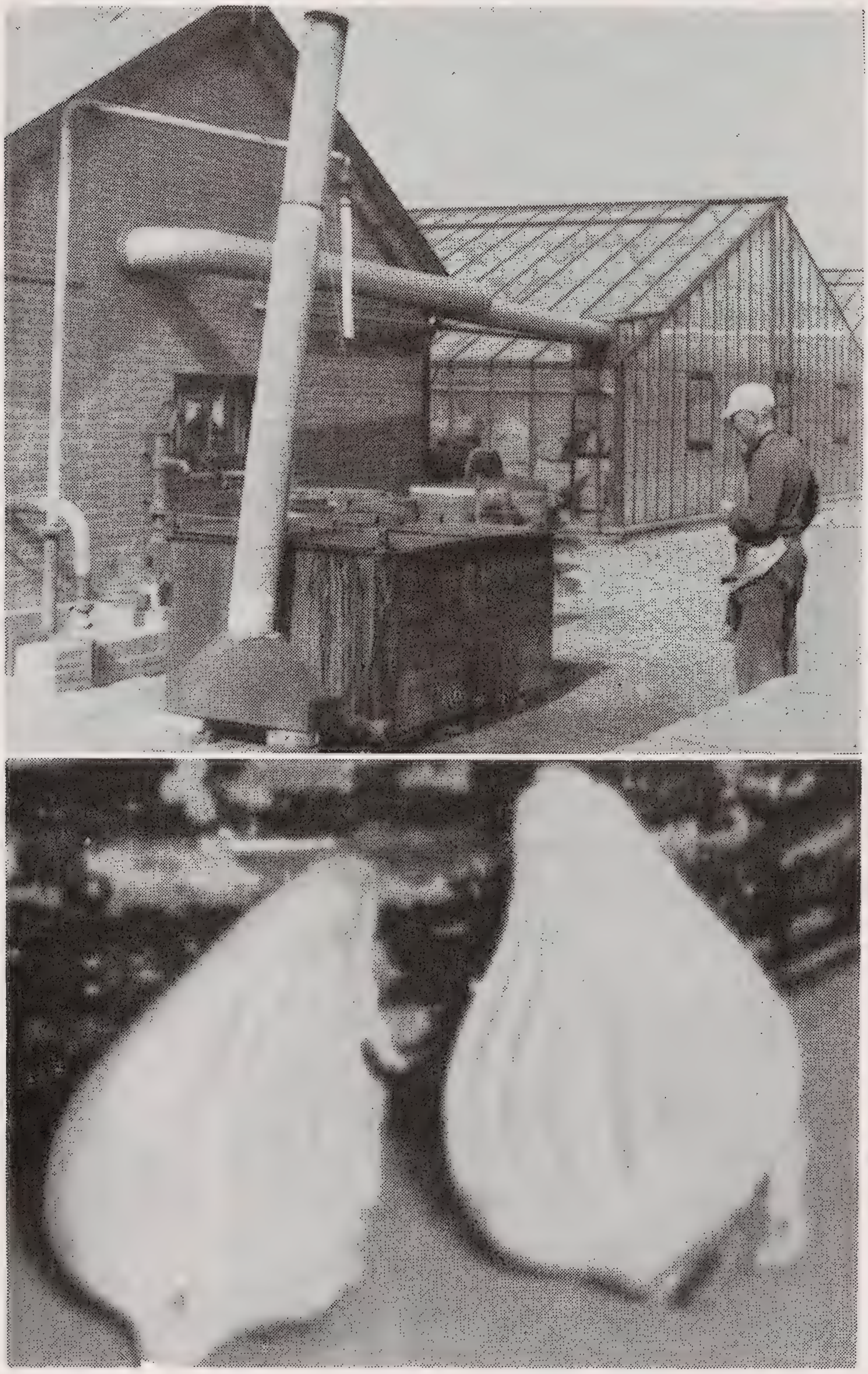

Fig. 22. *UPPER*, hot-water treatment of daffodil bulbs for killing nematodes.

LOWER, BULB AT LEFT: Dutch bulb producers grow bulbs in southern Italy for advancing pre-formed flower; BULB AT RIGHT: with smaller pre-formed flower in bulbs grown in Denmark, for K & M. of Nordvijk (see text).

Photo by Dr. Philip G. Corliss.

(2) The Dutch firms are growing great quantities of bulbs in southern Italy, where the embryo flower developed within the bulb is much more advanced than in similar bulbs grown in northern Europe. (Fig. 22) These operations are not for production of cut flowers, but only for production of bulbs for export sales.

(3) It is a traditional custom at Van Tubergen and Co. and other

nursery firms that each company employee be given a plot of land from which the early spring bulbs have been lifted, for use as a kitchen vegetable garden. At the time of our visit in early September, these tidy vegetable gardens were ready for harvest. Cabbage, collards, and root vegetables, in that order, were most prevalent.

(4) I was delighted to see in use the water bath where daffodil bulbs are treated for the elimination of 'eel-worms' (nematodes). (Fig. 22) The temperature of the bath must be maintained at 43.5 degrees C. for two hours. If it falls more than one half degree below 42.5 it is ineffective; if it goes more than one half degree above 43.5 the bulbs are destroyed! There is no thermostat to regulate the temperature—it is operated by one skilled workman! The heat is supplied by burning liquid paraffin; the flow of the paraffin drops is regulated by turning an ordinary faucet! If the temperature gets too high, the operator can turn a crank which raises the bulbs out of the water. The bulbs are placed in the bath in coarse burlap sacks. The water contains a red mercury compound which promotes faster root development!

CONSIDER THE AROID, HYDROSME RIVIERI

Beckwith D. Smith, *Jacksonville, Florida*

Five years ago I was much intrigued with a picture of one of nature's curiosities in the Arum family, the Black Sacred Lily of India, which appeared in a Sunday supplement. After much casting around among plant dealers a source of supply was found and I ordered a dozen bulbs. These were planted in ordinary garden soil on arrival, which was in August, and the bulbs were watered well with the expectation of seeing them develop into a palm-like foliage as described in the dealer's advertising, but, alas, the bulbs all rotted in the ground and were an utter disappointment! Of course, I did not know it, but the bulbs were set out during the dormant season, and I have found from successive growing seasons that they have a strong tendency to rot if so planted when they should be resting.

Nothing daunted, another supply of bulbs was obtained, but this time they were held until the latter part of April the following year, when they were planted in a sandy loam soil, enriched with rotted leaves and cow manure, after the growing sprouts had appeared in the center of each bulb. This planting was a happy one. The bulbs made beautiful segmented, palm-like foliage, the size of the bulbs increased from a small, plum size to a diameter of two and three inches. Some made offsets. None bloomed. That was the beginning of a most interesting plant growing experience. The bulbs were dug, dried off and stored in the house for the next year cycle.

This bulb plant was formerly called *Amorphophallus rivieri*, but since has been properly designated *Hydrosme rivieri*, commonly termed Devil's Tongue or Snake Palm, the latter no doubt due to the mottled effect of the stalk which resembles snake skin. The origin of *Hydrosme rivieri* is said to be Cochin-China. There has been very little published about its culture. In full growth the bulbs will make a diameter of from 5 to 6 inches, or larger. It puts up handsome tropical foliage, up to four feet tall, and blooms in spring before the foliage. The one leaf is much divided, umbrella-like, and an immense and magnificent purplish-maroon calla-like bloom will arise, which stinks to heaven. The odor is abominable for a while. It is best to put it outdoors at this time until the smell abates. Fortunately this objectionable smell lingers only for a few days. Apparently, the fetid odor attracts insects in its native habitat. Certainly, the flies are attracted to it. But I have not yet been able to produce seed. All of my increase in new bulbs has been from outgrowths around the top collar of the mother bulb when in full summer growth. All of the roots come from around the top of the bulb. The bottom of the bulb is as bald as a billiard ball. This, consequently, indicates to the prospective grower that the bulbs must be placed at least three or four inches below the surface of the planting soil, else the roots will burn and shrivel away from a too hot summer sun. In fall when foliage yellows and withers away the bulbs should be lifted and all roots rubbed off. It is normal for the roots to die off at this time for the resting period, and to prevent any danger of rotting. Bulbs should not be left outside in a cold garage, where they might decay, but should always be stored in a warm building, keeping them entirely dry. In spring be sure to keep your eye on the mature bulbs—they are liable to start blooming at any time!

Believe me, when I say this is a most magnificent plant, and one that you will long enjoy. Its tropical foliage during the summer months is most striking, and at any time during its development you will find it a stimulant to conversation and in all ways an odd and prized possession, exotically different.

A REVIEW OF THE GENUS **GAGEA** SALISB.

J. C. Th. Uphof, *Florida*

In 1943, Dr. Traub monographed the Tribe *Ixiolirieae (Amaryllidaceae)* consisting of the two genera *Ixiolirion* Fisch. ex Herb. and *Kolpakowskia* Regel (Traub, 1943)*. At that time he assumed according to the customary classification that these genera had no near relatives in the *Liliaceae.* Further research raised some doubts in his mind, and he formulated the hypothesis for testing experimentally that the *Ixiolirieae,* with inferior ovaries, are closely related to the genus *Gagea* Salisb., with a superior ovary, in the Tribe *Tulipeae (Liliaceae),* according to Hutchinson (1934)**.

The first step in checking such an hypothesis experimentally is to make an inventory of the genus *Gagea,* and at the request of Dr. Traub, I am pleased to present a general review of the genus *Gagea.* It is a genus consisting of little bulbous herbs which have always attracted my attention since I was a young man in the Netherlands. The four different species of *Gagea* found there have always been considered among the rarest species of our flora. Occasionally I would admire these little jewels at an exhibition of wild plants in Amsterdam, although to my regret I was never able to find them in the Netherlands, growing in their native habitat. In later years while botanizing in the Harz Mountains and the Thuringer Wald in Germany I had better luck. I still remember the masses of *Gagea lutea* during a sunny spring day in the Bruehle, a forest reserve near Quedlinburg am Harz. There were hundreds of these lovely little yellow flowering plants in the woods.

It is no wonder that early botanists had noticed them. In going through some of the early herbals of my private library, I noticed that Dodonaeus[1] had recorded them and called them *Bulbus sylvestris.* Looking through the equally outstanding work of his friend and compatriot Clusius[2] I find some illustrations which we recognize as belonging to *Gagea.* One is called *Ornithogalum pallido flore* and the other *Ornithogalum Pannon luteo flore.* He gives extensive descriptions of both of them. In a number of other early works they are described under *Ornithogalum* for example in the herbal of Chabraeus[3]. The illustrious Boerhaave[4], professor of medicine and botany at the University of Leiden, sums up 11 species of *Ornithogalum* that were grown in the extensive Hortis Medicus or Botanical Garden at Leiden. Some of them are now considered to belong to *Gagea*. *Ornithogalum* was also the recognized name by Linnaeus in his Species Plantarum. In the second edition of this work [5] he mentions eleven species, the first two that he describes, *O. luteum* and *O. minimum,* are now known as *Gagea lutea* (L.) Ker-Gawler and *G. minima* (L.) Ker-Gawler.

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* Traub, Hamilton P. The Ixiolirion Tribe. Herbertia 9: 53-59. 1942 (1943).

** Hutchinson, J. Families of Flowering Plants, Vol. 2, Monocotyledons. 1943.

[1] **Rembertus Dodonaeus.** Stripium historiae pemtades sex sive libri XXX. 222, Antwerpiae. 1583.

[2] **Caroli Clusius.** Rariorum Plantarum Historiae. 188-189, Antwerpiae. 1601.

[3] **Dominica Chaebraei.** Omnium Stirpium Sciagraphia. 219, Genevae. 1677.

[4] **Harmanus Boerhaave.** Index Alter Plantarum quae in Horto Academico Lugduno-Batavo II: 142-143, Lugduni. Batavorum. 1720.

For many years there was no recognized change in the name of the genus until 1806.

It was R. A. Salisbury [6] who called attention to the fact that the genus name of *Orithogalum* was not tenable for a certain group of plants which he called *Gagea.* It is of interest to read his views expressed in these early days which have often been overlooked or forgotten and which would fit very well into our present day ideas. Salisbury states in relation to the establishment of *Gagea* that ''In distinguishing many genera of the vast natural class of Monocotyledonus vegetables, it appears to me that the inflorescence is a character of primary importance, and I have little doubt that in future ages botanists will pay more attention to it than they have done hitherto, in all genera whatsoever . . . In the genus which I am now going to establish, this character of the inflorescence, if there was no other, distinguishes it from all the neighboring genera with an hypogenous corolla; or to use the Linnean phraseology, germen superum. Several species of it are already described under *Ornithogalum,* with which they neither agree in habit nor fructification; in a truly natural series, I believe they must follow *Hypoxis,* but that genus has a tuberous root, and germen inferum. I presume, therefore, to call them after a botanist who is indefatigable in collecting rare European plants, Sir Thomas Gage, Bart. F. L. S. and whose liberality in distributing them, places his name very high among those of his contemporaries.'' This statement is followed by a latin diagnosis of the new genus *Gagea.* Salisbury recognized seven species, e.g.—*G. fascicularis* being the first, followed by *G. bracteolaris, G. stellaris, G. spathacea, G. pygmaea, G. bulbifera* and *G. reticulatum.* Some of these were later reduced to synonyms.

Within the next hundred years the advance made in the study of the genus *Gagea* was gradual and not very extensive. Koch [7] and Boissier made important contributions. The latter author treated especially the species of the Orient [8] with smaller additions contributed by Sommier [9].

The present Century witnessed the addition of a considerable number of valuable contributions, the description of many new species, and an attempt to group the species under subgenera, sections and subsections in accord with their *probable* relationship within the genus. One of the first authors to give a general review of the known species was Pascher[10] in 1904, and who soon afterward published a monograph in 1905[11] of the Asiatic species. He considered the species from the standpoint of genetic development. To this genus he considered at first *Gagea* proper, to which he added also *Hornungia* Bernh. and *Plecostigma* Turcz. To the latter he added *Szechenyia* Kanitz. He divided *Gagea* into two large subgenera, e.g.—*Eugagea* Pascher and *Hornungia* (Bernh.) Pascher. *Eugagea* has mainly spherical, cylindrical seeds, they are edged; in *Hornungia* the seeds are flat and thin. He believed that sect. *Platyspermum* Boiss., *Plectostigma* Turcz. and *Szechenyia* Kanitz should also be added to this subgenus. His grouping is followed in the arrangement of the various species in this article, and therefore I will not go into further details until later.

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[5] **Carolus Linnaeus:** Species Plantarum, ed. II. Tom. I: 439, Holmiae. 1762.

[6] R. A. Salisbury. On the characters of a distinct genus hitherto confounded with Ornithogalum, and called Gagea; with some remarks on the importance of the inflorescence in distinguishing Genera. Konig and Sims, Ann. Bot. 2:553-557, 1806.

[7] W. Koch. Linnaea 22:225-229, 1849.

[8] E. Boissier. Flora Orientalis Tom. V:200-206, 1881.

[9] S. Sommier. Due Gagea nuove por la Toscana ed alcune osservazioni sulle Gagea di Sardigna. Boll. Soc. Bot. Ital. 246-256, 1897.

During the same year that Pascher published his work on the Asiatic species, there was also another ardent student of the genus *Gagea,* namely Terracciano who wrote an extensive monograph on the species of the Orient[12]

He too arranges the species into groups differing from those of Pascher. He also published an account of the genus in Northern Africa from where he mentions 10 species[13]. Soon the same author made a revision of the species that occur in Spain[14].

Later on a number of other species were added by various authors, especially by Russian botanists, who contributed many additions from Asia. The largest number of species described in any work, is no doubt given by Grossheim[15] who recognizes 74 species from the Soviet Union. The descriptions are in Russian, except the diagnosis of 14 new species which are presented in Latin. The author follows mainly the grouping of Terracciano, whereas Krause[16] follows that given by Pascher. He groups the genus within the *Allioideae-Allieae.* of the *Liliaceae.*

The species of the Genus *Gagea* belong to the temperate Zone of the Northern Hemisphere in the Old World. There are two large areas of distribution which may be regarded as a close continuation of each other. Most species are found in Central Asia, westward they spread through Caucasia, Mesopotamia and to the countries bordering the Mediterranean, including Southern Europe, as well as Northern Africa and the islands. Toward Eastern and Northern Europe the number of species gradually diminishes with only nine species in France, Belgium and Switzerland[17]. Hegi describes eight species in Germany[18]. In the Netherlands the number of species has been reduced to four[19] and they belong to the rarest representatives of the Dutch flora. In Great Britain[20] but one species is mentioned. In the Scandinavian countries there are only a few species.

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[10] **Adolf A. Pascher.** Übersicht über die Arten der Gattung Gagea. Lotos, Neue Folge, 14:109-131, 1904.

[11] **Adolf A. Pascher.** Conspectus Gagearum Asiae. Bull. Soc. Imp. Nat. Moscou. 353-375, 1907.

[12] **Achille Terracciano.** Gagearum florae Orientalis. Bull. Herb. Boissier 5:1061-1076, 1113-1128; 6:105-120, 1906.

[13] **Achille Terracciano.** Les espèces du genre Gagea dans la Flore de l'Afrique Boréale. Bull. Soc. Bot. France. Memoires. 52:1-26, 1905.

[14] **Achille Terracciano.** Revisione monografica della specie de Gagea della flora espagnola. Palermo, 1905.

[15] **A. Grossheim** in: **V. L. Komarov.** Flora U S S R. 4:61-112, 734-738, 1935.

[16] **K. Krause.** Liliaceae in: **Engler** und **Prantl,** Die Naterlichen Pflanzenfamilien. 2 Aufl. Bd. 15 a : 318-319, Leipzig. 1930.

In the Far East the number of species decreases eastward. In the extreme eastern countries the number of species decreases and finally in Korea and Japan there are only two or three species.

Some species of *Gagea* are distributed over a considerable area, for example *G. lutea*(L.) Ker.-Kawl. is found over almost all of Europe, inclusive of Corsica and Sardinia; it is also found in Caucasia and Siberia; *G. pratensis* (Pers.) Roem. et Schult. is likewise widely distributed over Europe and further into Asia Minor. Other species are known from only a few localities, e.g., *G. kashmirensis* Turr. occurs in Kashmir; *G. juliae* Pach. has been reported from Cyprus; *G. assyrica* Terracc. from Mountain Tur Tschell in Assyria and *G. Korshirskyi* Grossh. is native to the Mountains of prov. Darvas, Buchara. One has however, to be careful in deciding whether some species are really endemic, because many areas have been explored very little botanically.

There are a few species that are found in alpine regions, among which is *G. liotardi* (Sternb.) Roem. et Schult., *G. confusa* Terracc., *G. lowariensis* Pasch. and *G. pamirica* Grossh.

The number of known species has increased during the last few decades. Krause in Engler und Prantl, Die Natuerlichen Pflanzenfamilien 2 Aufl. Bd. 15 a: 319. 1930 recognized 35 species. According to the accounts of new species that have been described later, especially in Russian publications, the number of species are risen to 109. In this review, descriptions of 92 species are included, and 17 are listed as little known and doubtful. This was necessary in a number of cases because I could not obtain translations of the original descriptions in Russian not accompanied by Latin diagnoses.

These are some of the high-lights among the studies of the genus *Gagea*.

A comparative study of genera along the boundaries of two plant families will most likely produce some interesting results. First, a careful comparative morphological study of *Gagea* (in the *Liliaceae)* and of the *Ixiolirieae* (in the *Amaryllidaceae)* with special reference to evolutionary tendencies in each, should be made. This can be followed as suggested by Dr. Traub with comparative chromosome studies and breeding experiments. It should be noted that the geographical distribution of the *Ixiolirieae* parallels that of *Gagea* to a certain extent since the former are found from Asia Minor to Central Siberia, Pakistan, Turkestan, Buchara and nearby regions.

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[17] **Gaston Bonnier.** Flore Complète de France, Suisse et Belgique Tom. X: 74-77, 1936.

[18] **Gustav Hegi.** Illustrierte Flora von Mittel-Europa. Bd. II: 205-213, 1910.

[19] **H. Heukels. Rev. by W. H. Wachter,** Geillustreerde Schoolflora van Nederland. 13 ed. 713-714, 1949.

[20] **George Bentham and J. Hooker. Rev. by A. B. Rendle.** Handbook of the British Flora. 7 ed. 478, 1913.

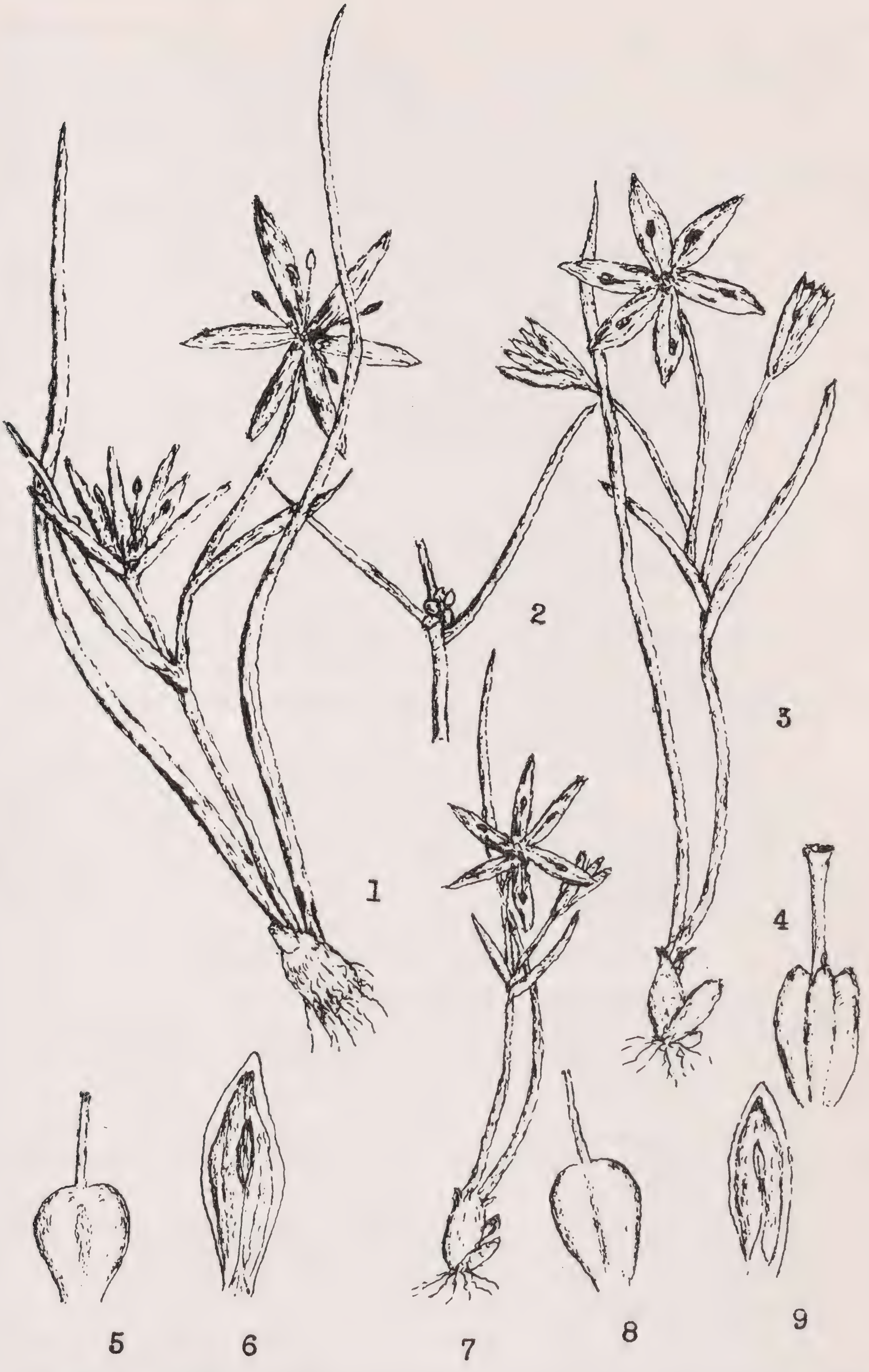
Many thanks are due for the kind help I received from the Library Staffs of the New York Botanical Gardens, and of the U. S. Department of Agriculture, Washington, D. C.; and to Dr. A. C. Smith, Curator of the Division of Phanerogams of the Smithsonian Institution, Washington, D. C., and to Dr. S. F. Blake, Senior Botanist of the U. S. Department of Agriculture.

Diagnosis of the Genus **GAGEA**

Gagea Salisb. in Koenig et Sims, Ann. of Bot. 2:555, 1806; *Stellaster* Heist. Syst. 19, 1748; *Ornithoxanthum* Link., Handb., Tom. 1: 161, 1829: *Hornungia* Bernh. in Flora 23: 392, 1840; *Bubbillaria* Zucc. in Abhandl. Akad. Muenchen 3: 299, 1843; *Plecostigma* Turcz. in Trauvetter, Imag. Flor. Ross. 9, 1844; *Boissiera* Haeseler ex Willkomn et Lange, Prodrom. Flor. Hispan. Tom. I: 218, 1861; *Solenarium* Dulac. Flor. Hautes-Pyrén. 117, 1867.

Small herbaceous bulbous plants. Bulbs 4 to 12 mm. in diameter. Leaves few, linear to lanceolate *(G. arvensis)*, flat, channelled with longitudinal groove *(G. saxatilis)*, being toward the apex cap-shaped, glaborus, sometimes ciliate along the margins. Basal leaves 1 to 2, sometimes 3; leaves around the stem, below the inflorescence 2 to 3. Inflorescense a few to many-flowered umbel, occasionally 1-flowered. *(G. saxatilis);* usually surrounded by leaf-like bracts, sometimes absent *(G. pusilla)*. Pedicels of the same inflorescence usually of various length. Segments of the perigone 6, free, seldom more or less, expanded, 3 to 5 veined, yellow, golden yellow, yellowish, greenish, seldom white or pink; the inner ones glossy; the outer ones dull, with greenish, seldom whitish or pink stripes on the back, carrying at the base a nectar gland. Stamens 6, longer or shorter than the style. Filaments filiform sometimes flattened at the base. Anther sacks ovoid or elongated, erect, connected by the base of the filament. Ovary superior, obovate to elongate, 3-celled; each cell with many ovules. Stigma small, faintly 3-cleft. Fruit a three-sided capsule with a thin wall, few seeded. Seeds spheroid, cylindric *(G. foliosa)* or flattened *(G. alberti)*, usually brown, often with longitudinal and latitudinal ridges *(G. liotardi);* sometimes furnished with appendages *(G. lutea)*. Embryo half as long as the endosperm.

Salisbury (1806) proposed the genus *Gagea*, and recognized seven species: *G. fascicularis Salisb.* (= G. Lutea (L.) Ker-Gawl.); *G. bracteolaris* Salisb. (= *G. pratensis* (Pers.) Roem. et Schult.); *G. stellaris* Salisb.; *G. spathacea* (Hayne) Salisb.; *G. pygmaea* Salisb. (= *G. lio-*



1. **Gagea arvensis;** 2. bulblets developed in the avils of the leaves; 3. **Gagea liotardi;** 4. pistil of **G. liotardi;** 5 & 6. pistil and perigone segment with stamen of **G. pusilla;** 7. **G. pratensis,** 8 & 9, pistil and perigone segment with stamen of **G. pratensis.**
Plate 4

tardii (Sternb.) Roem. et Schult.); *G. bulbifera* (L.) Salisb.; and *G. reticulata* (Pall.) Salisb.

Salisbury did not designate a holotype. Pascher (1904) restricted any choice of a lectotype to the subgenus *Eugagea* by adopting that name, but he did not designate any particular species as the lectotype. In accordance with the Code, *Gagea bracteolaris Salisb.* (= *G. pratensis* (Pers.) Roem. et Schult.) is hereby designated as the lectotype.

KEY TO THE SUBGENERA, SECTIONS AND SUBSECTIONS OF **GAGEA**

1a. Seeds roundish, angular, edged	SUBGENUS I. GAGEA
2a. First and second leaves free, each forming in its axil an erect bulb	SECTION 1. DIDYMOBULBOS
3a. Stamens as long as the perigone	Subsection 1. *Chrysanthae*
3b. Stamens shorter than the perigone:	
4a. Stamens half as long as the perigone	Subsection 2. *Pygmaea*
4b. Stamens usually reaching above the middle of the perigone	Subsection 3. *Arvensis*
2b. First leaf free:	
5a. Second leaf rudimentary	SECTION 2. MONOPHYLLOS
6a. Basal leaves *not* round, tubular:	
7a. Basal leaves *not* thick, narrow-linear	Subsection 1. *Minimae*
7b. Basal leaves thick, somewhat terete, linear	Subsection 2. *Luteoidea*
6b. Basal leaves round, tubular	Subsection 3. *Fistulosae*
5b. Second leaf *not* rudimentary:	
8a. Second leaf surrounding the peduncle	SECTION 3. HOLOBOLBUS
8b. Margins of second leaf more or less grown together as far as the inflorescence	SECTION 4. TRIBOLBOS
1b. Seeds flat, thin	SUBGENUS II. HORNUNGIA
9a. Stigma faintly or shortly 3-lobed	SECTION 1. PLATYSPERMUM
10a. Ovary attenuate at the base	Subsection 1. *Reticulatae*
10b. Ovary stipitate	Subsection 2. *Stipitatae*
9b. Stigma distinctly 3-parted	SECTION 2. PLECTOSTIGMA
1c. Little known and doubtful species.	

DESCRIPTION OF THE SUBGENERA, SECTIONS, SUBSECTIONS AND SPECIES

SUBGENUS I. **GAGEA.** Syn.—**Eugagea** Pascher, Lotos, n. ser. 14: 110. 1904. Seeds roundish, angular or edged.

SECTION 1. **DIDYMOBULBOS** Koch, Linnaea **22:** 229. 1849. The first and second foliage leaves free, and not surrounding the peduncle; each one having in its axil an erect bulb; the third and second leaves serving at first as a protection for the inflorescence.

Subsection 1. **Chrysanthae** Pascher, Lotos, n. ser. 14: 114. 1904. Stamens as long as the perigone; style considerably longer than the ovary; a distinct internode below the inflorescence.

1. GAGEA CHRYSANTHA Schult. Syst. 7:545; *G. chlorantha* Schult. Veg. 264, Boiss. Flor. Orient. 5:209, 1881; *Ornithogalum chloranthum* Bieberst. Flor. Taur. Cauc. Suppl. 264; *G. bohemica* Regel, Act. Hort. Petrop. 3:291; Flor. Turkom. 114, 115.

DESCRIPTION.—Plants often short, 1 or few flowered. Basal leaves linear, long attenuate, ciliate. Flowers 12 to 16 mm. long; outer segments of the perigone more or less ovate; the inner segments longer.

NOTES.—Native to Caucasia, northern Iran, Asia Minor. Here belongs var. *cyprica* Pascher from Cyperus and Asia Minor.

2. G. AMBLYOPETALA Boiss. et Helm. Diagn. 1:7; Boiss. Flor. Orient. 5:206, 1881.

DESCRIPTION.—Basal leaves somewhat succulent. Cauline leaves opposite or alternate, ovate, grooved at the base, gradually becoming linear, attenuate. Inflorescence umbel-like. Flowers large, three or four times shorter than the pedicels. Segments of the perigone subovate oblong or long obovate. var. *Heldreichii* Boiss is a more robust plant; var. *depauperata* Boiss. is slender.

NOTES.—Native to Asia Minor, especially the western and southern coastal region.

3. G. MONTANA Pasch. in sched. Herb. germ. Prag; *G. amblyopetala* var. *montana* Pasch. Lotos N.F. 14:121, 1904.

DESCRIPTION.—Differs from *G. amblyopetala* by its stronger bulbs, stem and inflorescence. Basal leaves are linear, 3 to 6 mm. wide, rather succulent. Cauline leaves are distinctly separate from each other, robust. Lower ones are linear. Inflorescense relatively long. Flowers about 15 to 18 mm. long. Outer segments of the perigone obovate to long obovate, at the apex acuminate; inner segments obtuse. Capsule one third as long as the perigone, obovoid, attenuate at the base.

NOTES.—Native to Asia Minor. Exsiccatae: Heldreich, Herb. Norm. Graec. nr. 1290.

4. G. SMYRNAEA O. Schwarz in Fedde Repert. 36:70, 1934.

DESCRIPTION.—Plants 3 to 5 cm. high. Bulbs two. Tunic straw-like, more or less leathery. Basal leaves two, as long or longer as the inflorescence, filiform, slender not grooved. Cauline leaves three, lanceolate, acuminate, glabrous or along the margins pilose-ciliate. Flowers one, 12 to 15 mm. long; anthers more or less orbiculate. Ovary oblong; style thread-like; stigma more or less globose or lobed.

NOTES.—This species is related to *G. amblyopetala* Boiss. et Heldr. The pedicels and segments of the perigone are, however, glaborus. Native to the mountains of Asia Minor, at 1000 to 2000 m. alt.

5. G. KASHMIRENSIS Turrell in Kew Bull. 11, 1928.

DESCRIPTION.—Bulbs two of unequal size. Stem erect to 14 cm. long Basal leaves two, linear to almost filiform, about 10 cm. long. Cauline leaves alternate, unequal, dilated at the base, lanceolate, furnished with a spath; apex attenuate; margins more or less white ciliate. Inflorescence 3 to 6-flowered. Pedicels more or less erect, about 1 to 2 cm. long. Flowers yellow; segments of the perigone narrow elliptic; the outer ones acute, 5 to 7-veined; the inner ones more or less obtuse, 3 to 4-veined. Stamens 6 to 7 mm. long; anthers oblong, 2 mm. long. Ovary obovoid, toward the base attenuate, 2 to 2.5 mm. long, 1.5 to 2 mm. wide; style 5 mm. long.

NOTES.—According to Turrell in addition to the presence of a white-haired indumentum on the stem and leaves, this species appears to differ from *G. amblypetala* Boiss. et Heldr. in the smaller and relatively more elongated bulbs and in a usually more pronounced internode between the two cauline leaves. It is native to Kashmir, Sriangar at about 1700 m. alt.

6. G. BITHYNICA Pasch. Lotos N.F. 14-120-121, 1904; *G. elongata* Pasch. in sched. Herb. Dir.

DESCRIPTION.—Plants slender, 15 to 25 cm. long. Tunic of the bulbs ash-colored, brownish, somewhat membranaceous, fibers none. Bulbs frequently small, reduced, globose often somewhat unequal. Basal leaves slightly depressed, more or less circular in crosssection; at the base attenuate, 1 mm. wide, obtuse. Cauline leaves more or less opposite, grooved at the base; the lowest 4 to 5 mm. wide and 2 to 4 cm. long, the upper 2 to 4 mm. wide and 1.5 to 3 cm. long. Inflorescence few flowered. Pedicels slender, longer than the flowers, somewhat erect. Flowers small, usually 6 to 8 mm. long, on robust specimens seldom to 12 mm. long, distinctly yellow. Outer segments of the perigone oblong or obovate-oblong, obtuse or nearly rounded at the edge; inner segments obovate, oblong with a rounded apex. Stamens about half as long as the perigone. Ovary somewhat obvoid, 3-sided, attenuate at the base; at the top slightly notched or somewhat margined; style about twice as long as the ovary. Capsule obovoid, twice as long as wide, attenuate at the base, truncate and somewhat emarginate.

NOTES.—This species can be easily distinguished from the related *G. chrysantha* by its very long flowering stalks; the light yellow flowers; the long internodes and the short filiform leaves. Native to Rumelia and Asia Minor. Exsiccatae: Piehler P. exs. Flor. Rumel. et Brit. *(G. amblyopetala)* Bornmueller. It. Anat. III, nr. 5593, 5594.

[To be continued in PLANT LIFE, Vol. 15, 1959.]

PLANT LIFE LIBRARY

AFRICAN VIOLETS, GLOXINIAS, AND THEIR RELATIVES, by H. E. Moore, Jr., Macmillan Co., New York. 1957. pp. 323, Illus. $10.00. Part one is devoted to growing gesneriads, "where they come from, and how they grow in the wild and in cultivation, pests and diseases, hybrids and hybridization. Part two is concerned with kinds of gesneriads at present grown in the United States." Part three consists of appendices on synonymy, pronunciation, meaning of names, chromosome catalog, etc. There are 5 color plates and 40 line drawings.

BOTANY FOR GARDENERS, by Harold W. Rickett. Macmillan Co., New York. 1957. Pp. 236. Illus. $4.50. Dr. Rickett has produced an outstanding text on "how plants grow" in which he explains the scientific basis common to all garden practices. This clearly written, well-illustrated text is a "must have" for all gardeners.

GARDENING: A NEW WORLD FOR CHILDREN, by Sally Wright. Macmillan Co., New York. 1957. Pp. 183. Illus. $2.75. The purpose of this book is to present the "basic fundamentals of year-round gardening, through which adults may guide their juniors." This charming book with a new approach is highly recommended.

SOIL FERTILITY AND FERTILIZERS, by S. L. Tisdale and W. L. Nelson. Macmillan Co., New York. 1956. Pp. 430. Illus. $7.75. The purpose of this book is to "present some of the fundamental concepts in a manner suitable for use by students of agriculture at the junior and senior levels in college." There is a brief historical introduction, and this is followed by chapters on "the elements required in plant nutrition, their role in plant growth and development, and the soil reactions that these nutrients enter into and which affect their availability to crop plants." Highly recommended.

HANDBOOK OF BIOLOGICAL DATA, edited by W. S. Spector. W. B. Saunders Co., West Washington Sq., Philadelphia, Penna. 1956. Pp. 584. The purpose of this handbook on the basic established data in the biogical and medical sciences is "to serve the student, teacher, and the expert who seeks information outside his own area of specialization." The information supplied by thousands of biological scientists is presented in tabular form. Highly recommended.

LIFE, AN INTRODUCTION TO BIOLOGY, by G. G. Simpson, C. S. Pittendrigh and L. H. Tiffany. Harcourt, Brace & Co., 383 Madison Av., New York 17, N. Y. 1957. Pp. 845. Illus. The authors believe that "there is a unified science of life," and they have attempted "to keep principles always foremost in mind and . . . to underpin the principles with supporting facts, and to show how the principles do arise from these facts." The book, representing a full-year course, is written for both the nonprofessional student of biology, and for those beginning a professional career. The parts of the book are concerned with (a) the living world and biological principles, and (b) the cell, maintenance and integration of the organism, the continuity of life, the diversity of life, populations and communities, and history of life. This book makes one envious of biology students today who have access to such a sound, attractive and stimulating text. Highly recommended.

PRINCIPLES OF PLANT PATHOLOGY, by E. C. Stakman and J. G. Harrar. Ronald Press, 15 E. 26th St., New York 10, N. Y. 1957. Pp. 581. Illus. $8.00. The purpose of this outstanding new book, by two eminent plant pathologists, is to "develop and illustrate the fundamental principles and concepts of plant pathology." They show that there is "real unity in the great diversity of information regarding plant diseases and their control." Special emphasis is placed on pathogens that afflict food producing plants, particularly those of international importance. This is required reading for all who are seriously interested in plant pathology. Highly recommended.

THE COMPLETE BOOK OF GREENHOUSE GARDENING, by H. T. Northen and R. T. Northen. Ronald Press Co., 15 E. 26th St., New York 10, N. Y. 1956. Pp. 353. Illus. $6.50. This attractive new book by two authorities on greenhouse gardening was written to introduce the home gardener "to new possibilities, new ways of making the most of his space and to enable him to grow the plants of his choice to perfection." The first nine chapters are devoted to general subjects concerning gardening under glass, and the remaining chapters give detailed information about the floral and vegetable crops. Any short comings, such as the inadequate treatment of the species and hybrid clones, and the omission of the cuttage method of propagation, under Amaryllis can be made good in a later edition. On the whole the book is excellent, and is highly recommended to all.

THE SPECIES PROBLEM, by E. Mayr (ed.). Amer. Assoc. Adv. Science, 1515 Massachusetts Ave., N. W., Washington 5, D. C. 1957. Pp. 395. Illus. $8.75. This outstanding book contains the papers presented at a symposium on the species problem in 1955. E. Mayr, the editor, discusses species concepts, and the difficulties and importance of the biological species. Verne Grant, John Imbrie and H. L. Carson discuss the species problem in plants, in paleontology and in genetics; J. L. Brooks, T. Sonneborn and C. L. Prosser consider the species problem with reference to fresh water organisms, protozonas, and the physiological aspects of the subject. John A. Moore looks at the species problem from the viewpoint of an embryologist. This stimulating book is required reading for all serious students of biology. Highly recommended.

EVERGREEN ORCHARDS, by W. H. Chandler, 2nd ed. Lea & Febinger, Washington Sq., Philadelphia 6, Penna. 1958. Pp. 535. Illus. $8.50. In this second edition of Dr. Chandler's outstanding text, the subject has been expanded to include several species not previously included. The text is written "in the hope that all good students of tree horticulture will want to see as much of the world as possible through their special field of study, and become acquainted with as much different tree behavior as possible." The crops included are citrus fruits, avocado, olive, litchi and related fruits, mango, cashew, evergreen nuts, papaya, passion fruit, annonas, myrtle fruits, etc., stimulant crops, coconut, oil palm, date, banana, and pineapple. This charmingly written text will be welcomed by all teachers and students of tree horticulture.

THE TREE IDENTIFICATION BOOK, by G. W. D. Symonds and S. V. Chelminski. M. Barrows & Co., 425 4th Av., New York 16, N. Y. 1958. Illus. $10.00. This new departure in method for the practical identification of over 130 different trees in any season includes over 1500 pictures. The book is in two parts—pictorial keys designed for genus recognition, and master pages for species identification. The book is "designed for everyone—the beginner, the expert tree-enthusiast, the teacher, or the student from elementary school through post-graduate work, the professional botanist."

THE NEW GREENHOUSE GARDENING FOR EVERYONE, by E. Chabot. M. Barrows & Co. 1955. Pp. 252. Illus. $4.75. This popular treatise on greenhouse gardening is an up-to-date handbook "for enthusiasts who want maximum results with minimum effort," no matter if the operation is carried on for pleasure or profit. The first six chapters are devoted to greenhouses, soils, fertilizers, etc.; the next seven chapters are concerned with details about the floral, vegetable and tree crops; and the remaining chapters with propagation, potting, pest and disease control, etc. Highly recommended.

THE LITTLE BULBS, by Elizabeth Lawrence. Criterion Books, 100 5th Av., New York 11, N. Y. 1957. Pp. 248. Illus. $4.00. This charming book about little bulbous plants is based on the gardening experience of Miss Lawrence in North Carolina and Mr. Krippendorf in Ohio. The earliest flowers such as hellebores, anemones, etc., are considered first; then follow chapters on naturalizing bulbs, snowdrops and snowflakes, squills and daffodils, hardy cyclamens, colchicums and crocuses, wood sorrels, irids, amaryllids, little bulbs in pots, and sources of bulbs. The reading of this book is a most interesting experience that is recommended to all.

ADVANCES IN PEST CONTROL RESEARCH, Vol. I., by R. L. Metcalf (editor). Interscience Publishers, 250 5th Av., New York 1, N. Y. 1957. Pp. 514. Illus. $11.00. Ten outstanding authorities present comprehensive reviews as well as critical evaluations of new concepts and developments in the field of pest control. This is required reading for all who are seriously interested in a sound scientific basis for pest control. Highly recommended.

PLANT DOCTORING IS FUN, by Cynthia Westcott. D. Van Nostrand Co., 120 Alexander St., Princeton, N. J. 1957. Pp. 280. Illus. $4.50. This is a biographical account of how Dr. Westcott "became a plant doctor and the fun she has had being one." This highly entertaining account of her varied activities is written in a charming style, and is highly recommended.

BE YOUR OWN NURSERYMAN, by R. Scharff. M. Barrows & Co. 1957. 425 4th Av., New York 16, N. Y. Pp. 223. Illus. $3.50. This is a practical book on the production of trees, shrubs and vines for those interested in landscaping the suburban home or the rural estate. The first nine chapters are devoted to general nursery practices; the next four chapters to trees, shrubs and vines for nursery and home, and the last chapter to the sale of surplus stock.

THE FLOWER ARRANGEMENT CALENDAR 1958, by Helen Van Pelt Wilson. M. Barrows & Co., 425 4th Av., New York 16, N. Y. The publishers sponsor an annual flower arrangement calendar contest. In this little book some of the photographs of floral arrangements accepted by the publishers are reproduced in calendar form for 1958. This calendar will be welcomed by the many who are interested in flower arranging.

PLANT ECOLOGY, by William Leach. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1957. Pp. 106. Illus. $2.00. The objective in this 4th revision of a standard text is to give "a clear and easily understandable account of both theoretical and practical sides of plant ecology, with a view to meeting to some extent the needs of the school, the training college and the university alike." This concise little book will serve as an introduction to the subject. Highly recommended.

SOIL-PLANT RELATIONSHIPS, by C. A. Black. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1957. Pp. 332. Illus. $7.00. The purpose of this outstanding new college text is to emphasize soils as a substrate for plant growth. It contains "a thorough analysis of some of the major soil-plant relationships" and is 'designed to give an over-all understanding of these relationships which can be applied in analyzing and interpreting specific situations." Highly recommended.

THE FAUNAL CONNECTIONS BETWEEN EUROPE AND NORTH AMERICA, by C. H. Lindroth. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1957. Pp. 344. Illus. $15.00. In this excellent book an attempt is made to "estimate the faunal exchange between Europe and North America" on the basis of "groups of animals which may be regarded as sufficiently worked through," and to "add some cases of special interest from other groups." The growing importance of the north makes this book particularly timely. Highly recommended.

GLACIAL AND PLEISTOCENE GEOLOGY, by R. F. Flint. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1957. Pp. 553. Illus. $12.00. Although based on the author's "Glacial Geology and the Pleistocene Epoch," this is a new book which emphasizes the North American Pleistocene, and "reflects the unprecedented advances in Pleistocene research during recent years." However, it remains primarily a text of glacial geology. Among the discussions are those of sea-floor stratigraphy, soils, frozen-ground phenomena, and geochemical contributions to chronology and the measurement of temperatures. Highly recommended.

AN INTRODUCTION TO GENETIC STATISTICS, by Oscar Kempthorne. John Wiley & Sons, 440 4th Ave., New York 16, N. Y. 1957. Pp. 545. Illus. $12.75. The purpose of this outstanding new work is "to present the basic statistical concepts and tools which the genetic research worker needs, with examples from genetics." This is a required text for those engaged in genetic research. Highly recommended.

A TREATISE ON LIMNOLOGY, Vol. 1. Geography, Physics and Chemistry, by G. Evelyn Hutchinson. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1957. Pp. 1015. Illus. $19.50. This is the first of two volumes addressed to workers in limnology and other fields with the objective of giving "as complete an account as possible of the events characteristically occurring in lakes. It examines the whole sequence of interdependent geological, physical, chemical and biological events that operate together in a lake basin." This outstanding work by an eminent scientist is highly recommended.

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THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

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III. PUBLICATIONS OF THE AMERICAN PLANT LIFE SOCIETY

BOOKS

1. **AMARYLLIDACEAE: TRIBE AMARYLLEAE,** by Traub & Moldenke (including the genera Amaryllis, Lycoris, Worsleya, Lepidopharynx, Placea, Griffinia, and Ungernia; Manila covers; 194 pages, incl. 18 illustrations. $5.00 postpaid. This is required reading for every amaryllid enthusiast.

2. **DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948,** by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $2.50 postpaid.

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[PLANT LIFE LIBRARY—continued from page 135.]

A NATURALIST IN PALESTINE, by Victor Howells. Philosophical Library, 15 E. 40th St., New York 16, N. Y. 1957. Pp. 180. Illus. $6.00. This fascinating book is based on the author's travels across Palestine over a nine months' period before it was split into Israel and Jordan. He writes "both as a naturalist and as a sharp-eyed and sympathetic traveler." This utterly charming book is written primarily for the layman, and recommended for all readers.

LIGHT, VEGETATION AND CHLOROPHYLL, by T. Terrien, G. Truffaut and J. Carles. Philosophical Library, 15 E. 40th St., New York 16, N. Y. 1957. Pp. 228. Illus. $6.00. Translated from the French by Madge E. Thompson, this book presents a concise exposition of present day knowledge of light as a form of energy, the light requirements of plants, the chemistry of chlorophyll and photosynthesis. Highly recommended.

JAPANESE GARDENS, by Jiro Harada. Chas. T. Branford Co., 69 Union St., Newton Centre, Mass. 1956. Pp. 160. Illus. $8.50. This attractive book by an outstanding authority on the subject, reinforced by 200 first-rate illustrations, will be welcomed by American gardeners generally. The general principles underlying Japanese gardening are first presented and then their development is traced over a period of thirteen centuries. All gardeners will want this utterly charming volume for their garden libraries. Highly recommended.

A COMPLETE GUIDE TO HARDY PERENNIALS, by Frances Perry. Chas. T. Branford Co., 69 Union St., Newton Centre, Mass. 1958. Pp. 288. Illus. $5.75. This book, in which more than 2000 species and varieties are described, is based on about thirty years of experience with perennials in the herbaceous border by an outstanding English authority. Chapters are devoted to history, preparing the border, planning and planting, pests and diseases, propagation, lists of hardy plants, and plants for special places and purposes. This beautifully illustrated book, including forty color plates, is highly recommended.

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Box 150, La Jolla, California

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Hamilton P. Traub
Harold N. Moldenke

THE AMERICAN PLANT LIFE SOCIETY
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HERBERTIA

1959

Year Book of
The American Amaryllis Society
26th issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 165.]

PREFACE

The beautiful cover design of the present issue is the work of Mr. Douglas D. Craft, of the Department of Design, Art Institute of Chicago. It is based on *Amaryllis striata* forma *fulgida*. Mr. Craft also presents an article on the same subject in this issue. We are all grateful to him for his contributions.

This 26th issue of the Amaryllis Year Book (Herbertia) is dedicated to Dr. Robert G. Thornburgh, of Palos Verdes Estates, Calif. He has been an amaryllisarian for many years, and has made outstanding contributions toward the evaluation of named *Amaryllis* clones. His work has been published in the Amaryllis Year Book, particularly since 1950. He has shown that the *Amaryllis* enthusiast, by a thorough study of his own collection, can make worth while contributions toward the evaluation and appreciation of the better *Amaryllis* clones. Dr. Thornburgh is a very busy professional surgeon, and finds needed recreation caring for, flowering, and evaluating his *Amaryllis.* On the basis of his accomplishments, the 1959 Herbert Medal has been awarded to him, and with it go the congratulations of all of the members. Dr. Thornburg contributes an interesting autobiography in the present issue.

Again, there are various articles on *Amaryllis* in this issue. Mr. Hayward reports on de Graff's letter to Peter Barr, 1890, on the breeding of *Amaryllis;* and also on old *Amaryllis* clones. Prof. Nelson writes on *Amaryllis evansiae* hybrids; Mr. Jack Scavia, and Mr. J. Gurrud Metz contribute *Amaryllis* breeding notes. Mrs. Tebban shares her experiences with hybrid *Amaryllis;* Mrs. Pickard writes about the use of *Amaryllis* and other amaryllids in the landscape; Mr. Stewart reports on his experiences with vegetative propagation of *Amaryllis,* and concludes his article on the growing of *Amaryllis* in the greenhouse. Mr. Claude W. Davis contributes an interesting article about *Amaryllis* production in Holland based on his European trip of 1958; Mrs. Hoyt writes about growing *Amaryllis* from seeds. Dr. Joseph C. Smith contributes notes on *Amaryllis aglaiae,* the yellow Amaryllis, detailing the first flowering of this species outside its native habitat in Argentina.

The other amaryllids are not neglected. Mr. Harradine writes about *Crinum graminicolum;* Dr. Whitaker pictures an unusually large specimen of *Crinum moorei.* Mr. Hannibal reports on the *Crinum* hybrid, 'George Harwood', originated by the late H. B. Bradley in Australia; on the culture of *Crinum, Brunsvigia, Nerine* and allies; and on two *Brunsvigia* x *multifloria* hybrid clones from Australia. Mrs. Leonard Swets contributes the first detailed report on the culture of *Brunsvigia orientalis* in the United States; Mrs. Polly Anderson shares her experiences in breeding Crinodonnas. Mr. Gilmer writes about some outstanding daylilies; and Mr. Shults reports on the "optimum x-ray exposure of Hemerocallis seeds" for the purpose of obtaining mutations.

Dr. Flory reports on the chromosomes of three *Zephyranthes* species; and Drs. Flory and Flagg contribute an article on the chromosomes of three Mexican *Habranthus* species. Dr. Howard writes about *Zephyranthes* x *ruthiae* clone 'Ruth Page'. Mr. Hannibal includes notes on

SMITHSONIAN INSTITUTION JUL 1 0 1959

the new Backhouse red trumpet Narcissus; and Dr. Cooley relates his adventures in providing daffodils for school children.

Mr. Hayward writes about *Haemanthus multiflorus* which is pictured in color. Dr. Joseph C. Smith details the culture of *Hymenocallis narcissiflora;* Mr. Burlingham shares his experiences with *Hymenocallis* in Florida; and Dr. Corliss writes of his experiences with *Hymenocallis* x *festalis* in Arizona. Miss Kell contributes a charming article on *Lycoris* in Texas; Mr. Hayward writes on *Lycoris radiata;* and Miss Vivian Grapes reports on *Lycoris* in western Nebraska.

Mrs. Menninger contributes the first comprehensive article on Nerines to appear in the AMARYLLIS YEAR BOOK. This is to be followed in the next issue by a catalog of the cultivated *Nerine* hybrids and species.

There are reports on local activities, including the 1958 *Amaryllis* shows in Louisiana and Alabama. Mrs. Fred Flick contributes AMARYLLIS ROUND ROBIN notes. There are still other contributions as shown by the table of contents.

Contributors to the 1960 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1959 in order to insure earlier publication of that issue. Unless articles are received on time, publication will be delayed to June or July as with some issues in the past several years. Your cooperation toward earlier publication will be greatly appreciated.

Hamilton P. Traub
Harold N. Moldenke

March 25, 1959,
5804 Camino de la Costa,
La Jolla, Calif.

CORRIGENDA

PLANT LIFE, VOL. 14, 1958

Page 48, under heading "(II)", 7th line, and 13th line, from top, for "*woelfleana*" read "*woelfleanus*".

Page 54, 20th line from bottom, for 'Amita' read 'Anita'.

INDICES OF HERBERTIA AND PLANT LIFE

Work was started in 1958 on the complete indices of the 15 volumes of HERBERTIA (1934-1948), and the first 15 volumes of PLANT LIFE (1945-1959). Thereafter indices will be provided for each five issues of PLANT LIFE.

Since the making of these indices is a large undertaking, it will take a few years to complete them. Announcements will be made when each one is ready.

In place of an annual index, the articles in these publications are grouped under subject headings for convenient reference,—Regional activities, Speciology, etc. The originally planned index due in 1948 was delayed on account of duty on Government emergency quayule research work. The second index is due in 1960 and should not be too long delayed.

Since it is recommended that each five volumes are to be bound in one book, it would appear to be desirable to make indices on that basis hereafter. In this way it may be possible to include the index at the end of each fifth volume hereafter.

Dedicated to

Dr. Robert G. Thornburgh

Herbert Medalist—Robert Grant Thornburgh, M.D., F. A. C. S.
Plate 1

ROBERT GRANT THORNBURGH, M. D., F. A. C. S.

An autobiography

An autobiography with a horticultural slant might be difficult to piece together for one whose profession is concerned with only a small portion of the vast field of medicine and surgery. Perhaps such a record might be faintly justified if one's ancestors were occupied with the important work of horticultural pursuits.

A grandfather some six generations removed with the same name came over from Northern England and settled in Virginia. Subsequently he married in North Carolina in 1728 and settled down to farming as did his progeny down to my own great grandfather. If I have any claims to horticultural leanings by heritage, much of it must stem from my mother's side of the family. Her father brought his Alsacian wife and daughter from Germany to America eighty years ago and became a farmer. He did both experimental and practical work with fruit and nut growing on his own orchards in the Northern part of California in the fertile Napa Valley.

My mother has always been a flower lover and gardener. My earliest experiences as a child having to do with flower raising were confined to digging and preparing her flower beds. These were inevitably followed by the uninspiring job of weeding out the tares. It was then my firm conviction after several years of this during my youth that horticultural activities were anathema and inimical to my own interests. I was very much a city boy and destined to remain so.

I was born in Beatrice, Nebraska on February 28, 1906 to Verne N. and Marie (neé Grossholtz) Thornburgh. My father's business took us to Lincoln, Nebraska where my brother, Charles Frederick was born on June 7, 1909.

My boyhood interests and hobbies were greatly varied but centered the longest on music. My father was very near to me and spent much of his spare time with me in such activities as hiking, fishing, music, the proper use of tools, collecting postage stamps and the one dearest to his heart, the assiduous pursuit of the ethnology of the Amerindian with fringe interests in anthropology. In these last interests he was frequently consulted and visited by men from several educational institutions. He tragically passed out of my life by accidentally drowning when I was nearly fourteen years of age. The interest that he aroused in me for music served me well during my school days. I began to play professionally in combination with local orchestras while still a senior in High School. This preoccupation with music was to continue through my college years even during the 1933 Depression while studying medicine.

The University of Nebraska granted me a degree of Bachelor of Science in 1929. In 1934 its College of Medicine granted me the Doctor

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of Medicine degree. An internship of two years was spent as House Physician at the Temple University Hospital in Philadelphia. Deciding then that I wished to become an ophthalmologist to specialize in the treatment of diseases of the eyes, the following three years and nine months were spent in a Residency as House Surgeon at the New York Eye and Ear Infirmary in New York City. This institution is the oldest training institution for ophthalmologists in the United States and is only four years younger than Moorfields in London which has the distinction of being the oldest eye hospital in the world. The New York Eye and Ear Infirmary appealed to me since it had educated many famous ophtholmologists who after leaving there had subsequently set up other institutions which are now most famous in their respective cities of Boston, Philadelphia, Baltimore, etc. The hospital records show patients who were Revolutionary War Veterans and exhibited the handwriting of many ophthalmologists both living and dead.

Desiring to enrich my knowledge of the treatment of eye disease even further, I became associated in the private practice of ophthalmology for the greater part of the next two years in New York City with Conrad Berens, M. D., an internationally known author and ophthalmologist.

During the last year in New York City much of my spare time was occupied in preparing myself for the examinations of the American Board of Ophthalmology Having then become a diplomate of this board the subsequent privilege of belonging to the American Academy of Ophthalmology and becoming a Fellow of the American College of Surgeons was a simple step. During this time my services as an instructor in ophthalmic surgery were needed at the New York Eye and Ear Infirmary where the honor of Acting Assistant Surgeon was given me. Dr. Daniel Kirby, the noted medical author of the presently two most outstanding and definitive works on cataract surgery, placed me on the Faculty of the New York University as Instructor in Ophthalmology during my last year in New York City. These last services were rendered at the Bellevue Hospital and for a time I also served on the panel of examiners for The American Board of Ophthalmology.

All of this time my nearest contacts with the products of floral horticulture were confined to hurried passing of florists in either the subways or streets or to an occasional visit to Central Park.

On June 29, 1935 I was married to the beautiful Marie Jassamine Dunn, a girl of strictly Irish heritage. Our marriage was blessed with four children. Two girls, Marie Jassamine, born February 9, 1941, Hillary Geohegan, born June 10, 1947, and two boys, Robert Grant, Jr., born January 4, 1943, and Frederick Harcourt, born February 3, 1946, now command the lion's share of our time.

My first beginning with horticulture was in a way almost second hand since after acquiring ten acres of land suitable for tillage, a part of a total of 40 acres, the land was worked in partnership with a relative who owned the remaining 30 acres. Over a period of ten years much experimentation was done in the variety of crops and many hard lessons learned. These had little to do with the quality of the crops, which were good, but with the market and its status at the time of harvest. When one needed to plow under five acres of beautiful tomatoes because to pick them for market would lose 10 cents per crate, it seemed discouraging but it wasn't always so. Some planting of bulbs was undertaken with success but it never reached a profitable level. There it can be seen that my major horticultural interests were largely commercial.

My own intense interest in hybrid amaryllis began a good many years ago when my mother had asked me to keep one of these large bulbs for her until she could move to California. It was planted in a butter tub with half adobe soil and half peat moss to break up the soil and it was given a squirt of water from the hose whenever it happened to be convenient. When it came time to bloom the result was so startling as to be nearly unbelievable. It had developed several large offsets which all came into bloom simultaneously. Dividing the offsets and replanting did not prevent them all from blooming again the following year. This was such an easy accomplishment, and the bulbs had seemingly thriven on neglect! After that a great effort was made to get more information about such a phenomenal bulb. The name of a large commercial grower was obtained. Mr. W. E. Rice of Downey, California, whom I promptly visited. He imparted much of his hard earned amaryllis lore to me and though at first he displayed an old world reluctance to talk of his experiences, it was not long until we were fast friends. Subsequently I was to make another friend with one of the finest gentlemen I had ever had the privilege of knowing in this interest. Mr. Herman Brown and his most gracious wife were to entertain me at tea on several occasions with protracted discussions on amaryllis growing and with extensive experiences obtained in Africa. The Howard and Smith nursery in Montebello, California afforded a diverting place to visit during the month of April because of their hybrid amaryllis. It was Mr. Rice and Mr. Brown who stimulated me to begin making my own crosses and selections. Attempts to improve the strains, if such is possible, were to become a permanent interest. Soon a large plot of ground was becoming filled with seedling blooms each year. People began to visit me from other cities and I made many new friends in this special floral interest. Finally the empty field adjacent to our home began to be invaded with hybrid amaryllis crosses. When it became necessary to build a new home in the same neighborhood, the bulbs disposed of might have taken up the space of half a freight car. The finest seedlings were saved and replanted in the new location.

For many years in California my attention was given to growing and propagating camellias—a most gratifying occupation. Attempts to produce new varieties of camellias by crossing were slow and not productive of many worthy new varieties. Whereas this interest in camellias has not disappeared by any means, most of the floral interest was centered on the happy occupation of acquiring new strains and varieties of hybrid amaryllis. That it has been a rewarding experience is reflected in the great pleasure that can be shared with others. Enthusiasm is renewed each year. When the blooming season is gone, it is difficult to recall to mind just how vivid and beautiful the amaryllis were. When the inevitable blooms again appear in the early springtime it seems almost as if it were an original experience. One is left with a feeling of incredulous astonishment each year when the blooms return as if it could not have been possible that the previous season had produced such fine specimens.

SIMON ADRIANUS DE GRAAFF TO PETER BARR, 1890

WYNDHAM HAYWARD, *Florida*

The aims and techniques of the 19th century de Graaff firm of Holland, pioneer breeders of Holland Amaryllis, both before the introduction of Amaryllis Leopoldii and afterward, are presented in the words of Simon Adrianus de Graaff of Leiden, ''The Younger de Graaff'', in a letter to Peter Barr, famous London bulb dealer, dated Jan. 30, 1890, which has been released for publication by Simon de Graaff's grandson, the eminent daffodil, lily and iris specialist, Jan de Graaff, of Gresham, Ore. See also Dr. Traub's ''The Amaryllis Manual'' published in 1958.

Mr. de Graaff points out, to avoid confusion in the minds of contemporary readers and Amaryllis students, that the present-day H. de Graaff & Sons, Inc., of New York and Lisse, Holland, has not had a member of the de Graaff family as a member of the firm in 30 years. Jan de Graaff's present family firm is the de Graaff Bros., at Noordwyk, Holland. Today's popular Van Meeuwen Amaryllis strain is the product of Messrs. C. G. Van Meeuwen & Sons, of Heemstode, Holland, a subsidiary of the H. de Graaff & Sons, Inc.

The de Graaff Bros. firm is one of the largest producers of quality Dutch bulbs in the business at this time. Jan de Graaff reports that he can still recall clearly the beautiful collection of Amaryllis in his grandfather's greenhouses prior to the old man's death. S. A. de Graaff lived from 1840 to 1914. The Amaryllis collection was broken up and sold after his death and during World War I.

The highest tribute is paid to the work of Simon Adrianus de Graaff in ''Die Amaryllis'' by the late Henry Nehrling of Florida, pioneer Amaryllis specialist of the Southeast, in his popular monograph ''Die Amaryllis'', Berlin, 1908, and also by Dr. Traub in the recently published ''The Amaryllis Manual'' (1958).

Nehrling writes: ''Nevertheless, the most famous of all Amaryllis cultivators is the de Graaff firm, which has occupied itself with the culture of these plants for more than 100 years . . . in the year 1862 the younger de Graaff began to increase and to improve his Amaryllis collection, in that he not only employed *Amaryllis psittacina* and other species, but also bought the best hybrids and used them in his crossbreeding.

''From the time of the elder de Graaff an especially colorful hybrid was in existence which was named Amaryllis Graveana. Mr. S. A. de Graaff used it and produced from it and *A. psittacina,* the most important and advantageous of all Amaryllis, namely, Amaryllis 'Empress of India', with glowing red, white striped, very large flowers, with very broad and rounded petals. This signified a further stepping stone in the development of the Amaryllis. It was the starting point of all the big-flowered colorful, beautifully formed Amaryllis which are still abundantly characterized as the 'Empress of India Race' or strain of hybrids, in comparison with the *Amaryllis vittata* race or strain.''

Nehrling ranks the Amaryllis 'Empress of India' with the immortal *Amaryllis* x *johnsonii, Amaryllis* x *acramannii* (1835) and 'Acramannii Pulcherrima' (1850), as among the most significant hybrids of the middle 19th century. He imported several specimens of this choice hybrid for his collection at Gotha, Fla., where he did his early hybridizing, around the turn of the century. Its glory was not eclipsed until long after the arrival of the giant flat faced types resulting from crosses with the famous *Amaryllis leopoldii,* found by the Veitch collector Pearce in the Andes Mts., and sent home to his firm in England where it bloomed for the first time in 1869. It was several decades later before the Leopoldii types became completely overpowering in their influence on popular Amaryllis form and fashion.

James H. Veitch of the famous British plant firm of the 19th Century, relates in ''Hortus Veitchii'', London, 1906, the part that the de Graaff variety 'Empress of India' played in their own Amaryllis breeding program, page 465-469. In part he wrote:

''Van Houtte and other horticulturists in Belgium and France took up the culture of these plants soon after the appearance of 'Acramannii Pulcherrima' and produced many fine seedlings remarkable for brilliance of coloring, though usually deficient in form, with narrow pointed petals of unequal size.

''The elder de Graaff of Leiden afterward surpassed Van Houtte's productions, especially with one named 'Graveana'. This fine form afterwards used by his sons in connection with a dark form of *Amaryllis psittacina* produced the fine 'Empress of India', still in cultivation.'' The Veitch firm started its own Amaryllis hybridizing work in 1867, around the time of the introduction of *A. leopoldii,* hence they were fortunate in having this immensely valuable germ plasm available at the very beginning of their work.

The text of Simon Andrianus de Graaff's letter to Peter Barr, as released for the first time for publication by Jan de Graaff follows:

''Leiden, Jan. 30, 1890— My Dear Barr, in reply to yours of the 28th I send you information as far as I can give. I shall put answers according to the questions.

''(1). My father was starting [to breed Amaryllis] in 1830, before that my father's uncle was since 1790 growing only *A. vittata* and Johnsonii. My father was always working for [new] colors, and took up fulgida and crocata [varieties of *Amaryllis striata*], crossing these four varieties over and over amongst themselves, and used also *A. formosissima.** The result was that we had fine deep colors, but only small flowers.

"As soon as I started, 1862, I was looking out for large flowers, and used for that purpose varieties of *A. psittacina,* and *fulgida* [an illegible word here], crossed our small ones with the large blooms, and the large with small ones, so we got the fine forms and deep colors just as well as the waxy white Amaryllis, and of course all shades between. The only care I took was that I brought the colors together which were most acceptable. That means I did not cross scarlet with white—and never troubled about the father or mother—this includes answers for questions 2 and 3.

"(4) Now we cross only best forms with the color we want, never fall back on the species.

"(5) It can be done in four years, but not being able to give the seedlings so much room, we take six years, but this only for our strain. Leopoldii and Pardina (types) can be done in two years.

"(6) and (7) We have our bulbs in pots on the bulb shelves till we are ready for repotting, the old soil is shaken off, we do not touch the roots, but plant them, so that the old root is growing at once again. It is sure that the flowers are developing to perfection by this practice. We cut the foliage off in November and keep pots and bulbs as dry as possible during winter, never water them during that period of rest.

"(8) If we could, we should repot our Amaryllis in January, but having no room at that time, and not wanting them in bloom early, we do it in the middle of February. As a rule they are in bloom after four to six weeks.

"(9) We prefer heat from tan [bark], the pots plunged in the tan, and not too much top heat; so that the development is more natural we keep our top heat at about 60 degrees. If tan could not be used, we should take other bottom heat by tanks or sawdust. 'Empress of India' is the result of crossing a dark seedling of *A. psittacina* with a seedling my father raised, ['Greveana'], *not* the French Gravinea. We used both for father and mother, and do not know which of the two is the father or the mother. We never care for that, only looking at the result. I hope this can be of some use to you, Yours truly, S. A. de Graaff."

The questions from Peter Barr which Mr. Simon de Graaff was answering in this most revealing letter are obvious in most cases. Nos. 1, 2 and 3 were evidently about the origin and date of beginning of the de Graaff strain, and the stock used in early breeding; (4) what they currently used in breeding; (5) how long the de Graaff firm took to grow Amaryllis bulbs to maturity; (6) and (7) potting and winter dormancy techniques; (8) time of repotting bulbs; (9) what sources of bottom heat the de Graaff firm employed. Also the origin of the famous 'Empress of India'. It seems unfortunate that no illustration of

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* **Sprekelia formosissima.** Luther Burbank also reported using this in Amaryllis breeding but later workers have never been able to verify their work.—W. Hayward.

'Empress of India' has been found, and the bulbs seem to be lost to cultivation.

FOOTNOTE.—Under date of Sept. 16, 1955, Jan de Graaff of Gresham, Oregon, writes as follows: "I looked up the dates of my grandfather and find that he, Simon Adrianus de Graaff was born in Zoeterwounde, Holland, Febr. 15, 1840, and died in Leiden, April 25, 1914. His father was Jan de Graaff, born in Lisse, Holland, June 25, 1797, and died Jan. 29, 1862. This Jan de Graaff, my great-grandfather, bought the nurseries near Leiden on Febr. 4, 1830, and so he would be 'The Elder' de Graaff.

"It always amused me to know that the nursery bought by Jan de Graaff in 1830 was called 'America'. I often wonder if this had anything to do with the fact that later on, my father, William de Graaff, born April 30, 1873, came to this country on his first trip abroad.—Jan de Graaff".

ELIOVSON'S SOUTH AFRICAN FLOWERS FOR THE GARDEN

L. S. Hannibal, *California*

During the last few years we have had several good books appear on South African Flora (See list at end of article), but the recent book is by far the best to date—Sima Eliovson's *South African Flowers for the Garden,* a treatise on Bulbs, Annuals, Perennials, Succulents, Shrubs and Trees: How to grow them, identify them, and use them for effect. Published by Howard B. Timmins, Cape Town (Price from Publisher $10.50, 305 pages, size 9 x 12 inches).

There are over 16,000 plant species known in South Africa. Obviously no one book or person could attempt to describe all, but after years of plant hunting, research, and horticultural experience Mrs. Eliovson has selected some 450 items as ideal material for South African Gardens. Obviously many of these plants will grow in Southern California, New Zealand and elsewhere, and a number are old friends. But there are many items not in general use, and some species are described for the first time, with notes as to culture and photographs. The *Amaryllidaceae* are well represented, with a number of plates being shown in color.

For example the following plants are described or recommended for garden use, and all are strangers to California gardens: *Clivia caulescenes* and *C. gardeni, Crinum graminicolum, Cyrtanthus collinus, C. contractus,* and a half dozen more, *Haemanthus, Nerine alta* and *N. krigei*—All should be introduced and popularized, and used in breeding.

Since many of us grow other South African bulbs, the descriptions of thirty five out of a known 168 species of Gladiolus are always a source of interest, particularly the ratings assigned the plants in order of preference. The same applies to *Babiana* since this group contains some eighty known species. In fact the one feature which will invariably cause lengthy discussions over all of the plants is the ratings assigned them for garden usage. Conditions found in Johannesburg are not always applicable to other climatic areas, and what may do best there has sometimes been found a second rate performer in California or Australia. However, such should be anticipated since many plants are critical as to environment; then in many instances the forms which we grow here may not be the best stock or selection from the wild. So the ratings must be accepted conditionally. Otherwise the book is a must for the collector.

As an added feature there are a number of recommendations for use in landscaping for entirely South African material, and a list of nurserymen handling such material is given. The only discouraging feature over plant importations for that area are the new inspection regulations which make it practically prohibitive to export anything except seed from South Africa. We hope that this can be cleared up as it is a serious handicap to bulb collectors in the States.

Other recently published South African garden books (order through your book dealer):
K. C. Stanford, "A Garden of South Africa Flowers".
A. H. Hamer, "Wild Flowers of the Cape".
E. G. Rice & R. H. Compton, "Wild Flowers of the Cape of Good Hope".

TRAUB'S "THE AMARYLLIS MANUAL"

WYNDHAM HAYWARD, *Florida*

The appearance of Dr. Hamilton P. Traub's "The Amaryllis Manual" (Macmillan, New York, 1958, $7.50) signals a new and significant landmark in the horticultural-botanical study and appreciation of the genus *Amaryllis* L., a work of fifty years' creation, summing up the life-long private research and experimentation of a professional plantsman, a brilliant scientist, gardener and plain "dirt grower" who knows and lives with his bulbs.

Now retired and living in the friendly subtropical climate of La Jolla, Calif., with his numerous species all about him, Dr. Traub may take heart-warming pride in the results of his labors in the genus *Amaryllis,* which will serve our needs until a new edition comes along for the inclusion of new discoveries and developments. He has created another in the master-works of great plant writing, a manual to cover an entire genus probably as completely and carefully as a single author can achieve in a lifetime.

It was as a boy in the midwest that Dr. Traub undertook his first *Amaryllis* experiments and cultural studies. It was decades later in Florida that he rejoiced to see his enthusiasm and keen scientific interest bring about the formation of the AMERICAN AMARYLLIS SOCIETY in 1933, to promote and foster further serious study of the genus *Amaryllis* and allies on a world-wide scale, and began the editing of the inimitable series, HERBERTIA, the Amaryllis Year Book, which have appeared without fail each year since then.

Now a quarter century later he at long last sees his great compendium, concordance, one might say, of the genus *Amaryllis* L. appear in print, the fruit of his long and arduous studies and research, concentration, keen penetration and understanding of the problems of plant ecology, systematics, physiology, phylogeny and all the rest. Few men are so fortunate to see the great reward of their life's work tossed into their laps while they are still young in heart and mind, ambitious and vigorous toward their eternal goal and still good for years of the creative life ahead.

In a way, this is a left-handed plea to the good Doctor, to conserve his energies for at least one more outstanding work from his typewriter—next a treatment of the entire *Amaryllis* family, to rank in the 20th century with William Herbert's and J. G. Baker's in the 19th, and a book of plantsmen's memoirs—telling us all the things he has done and seen and heard, and how it all came about.

We say this soberly—this is a great book. Those are words not to be bandied about in book review columns, but this is exceptional. This is a new kind of plant book, in the words of Prof. Ira S. Nelson—"to me it represents a new 'species' of horticultural books. Nowhere else have I seen in a single book information which appeals to a beginning amateur, an advanced gardener and a professional student of plant science . . . recognition of the need for reliable information at all levels is most gratifying. I hope that other authors who write about horticultural plants will follow this example. The 'Amaryllis Manual' is a new kind of book indeed which fits the needs of our new era in Horticulture."

Prof. Nelson has said it in better words and more succinctly than this reviewer could have done. He is the professional teaching horticulturist and works with young men and women and knows the kind of books they should have, the kind that will appeal to them, that will do them the most benefit. But this is not a classroom book, although it will probably be used in many plant courses,—botany, gardening and horticulture. It is a book for the bulb grower who wants all the information about *Amaryllis,* the taxonomist who wishes to know the latest in classification of the genus and its species; it is a hobby book supreme for the *Amaryllis* enthusiast, the plant devotee who wants the innermost "secrets" of his favored specialty, and for the general gardening reader who just wants to be intelligent about plants he may or may not grow, and the specialist who makes a fetish of his culture and exhibition blooms.

We venture if you are sincerely interested in plants, any plants of course, but especially Amaryllis, you will find this book as absorbing as any novel. If you are only casually interested in plants but like to read about them, you will find sheer beauty, dramatic discoveries, brilliant scientific research, amazing plant history, and a good bit of geography in this work.

Just open a few pages—the illustrations are good and plentiful, but do not overwhelm the text—the story remains the most important—some will be intrigued by the records of *Amaryllis* through the centuries down to the highly scientific industry now existing to produce showy named varieties of supreme quality types by the new vegetative propagation techniques. Here Dr. Traub has had his own major share in the scientific research and development.

Then follow absorbing pages about the types and forms of the *Amaryllis,* the main sections of the genus, doubles, pure whites, old species, and a flood of new ones which have poured into world gardens in recent decades, offering a great new supply of germ-plasm for hybridizing research. Dr. Traub and the American Amaryllis Society have had their major share in these.

There are chapters on cultural suggestions, formulae for growing "mixes" by proven veterans in the field, production of the bulbs, marketing, diseases, breeding and other phases. Possibly the most interesting to the historically minded will be the sections on the story of nomenclature in the genus *Amaryllis* L. itself, which Dr. Traub explains with his full stature and integrity as a plant scientist and researcher to back his decisions. As one who has been an interested participant in this discussion for more than 20 years, it looks to this observer that the last word has been said by Dr. Traub in his book, concerning the validation of the Linnaean *Amaryllis belladonna* L. and the generic name *Amaryllis* L., over William Herbert's interpolated "Hippeastrum." But Dr. Traub's evident determined effort to leave no stone unturned and to express the fullest possible brief for the original name has us wondering if some echoes of reaction are not still rattling around somewhere.

The chapter on nomenclature, as we have tried to point out, is well worth the price of the book, if you are interested in such things—and you will be, surprisingly so—if you but dip into it! It is a fantastic state of affairs that existed in the genus *Amaryllis* L. for 100 years until Dr. J. C. Th. Uphof wrote his original article in the 1938 HERBERTIA.

Appendix C is a monograph in itself, with "key to the known species and their complete descriptions." The various modern commercial strains are covered fully in preceding chapters; there is a valuable and helpful glossary and a bibliography; and a sound index. Best of all, Dr. Traub is writing to minds of intelligent plantsmen of high school and college level and beyond . . . not just “down” to a common moronic denominator as so many of our garden authors seem to be doing. All hail to Dr. Traub and his new Amaryllis Manual . . . and let us have more like it before we say farewell . . . maybe even a whole brilliant category of treatises on plants giving an “ultimate conception” of gardening.—*Wyndham Hayward, Winter Park, Florida.*

CORRIGENDA

THE AMARYLLIS MANUAL, BY HAMILTON P. TRAUB. MACMILLAN CO. 1958.

Page ix, 3rd line, after “are” insert “Mr. & Mrs. Mulford B. Foster, of Orlando, Florida;”

Page 3, 16th line from bottom, for “the Latin for” read “from Hermann’s herbal phrase meaning”

Page 27, for “plena” read *“semiplena.”*

Page 42, 4th line from bottom, for “rosters” read “treasures.”
  8th line from bottom, for “and hybrid propagation” read “introduction”

Page 61, 18th line from top, after “var.” insert *“semiplena* forma”

Page 88, 3rd line from bottom, for *“plena”* read *“semiplena”*

Page 89, 4th line from bottom, for *“plena”* read *“semiplena”*
  15th line from bottom, for *“plena”* read *“semiplena”*

Page 181, at end of 3rd paragraph, add “See also page 128, Chapter 10.”

Page 242, 4th line from top, after “standpoint” insert, “(see Table A),”
  20th line from top, for “Hann.” read “Gouws”

Page 248, first footnote, 3rd line, for *“rautanensis”* read *“rautanenii”*
  2nd footnote, 9th line, for *“damazinana”* read *“damaziana”*

Page 250, Table C, for *“A. damazinana”* read *“A. damazana”*

Page 250, Table C, for *“A. damazinana” read “A. damaziana”*

Page 267, change the first 6 lines to read: “4-A. AMARYLLIS AMBIGUA (Herb.) Seub., in Mart. Fl. Bras. 3(1): 152. 1847; Traub & Moldk., Amaryll. 186. 1949. Syn.—*Hippeastrum ambiguum* Herb., Bot. Mag. sub pl. 3542. 1837; *H. ambiguum* var. *longiflorum* [=*ambiguum*]—Herb., Bot. Mag. pl. 3542. 1837; *Amaryllis ambigua* var. *longiflora* (Herb.) Sweet, Hort. Brit. ed. 3. 674. 1839; *Amaryllis solarodriflora* var. *conspicua* Hannibal, Herbertia 10: 151, fig. 106. 1943; *Amaryllis elegans* var. *ambigua* (Herb.) Traub & Moldk., Amaryll. 186. 1949.

Page 267, 5a., after “var. VITTATA” begin new paragraph with “L’Hérit. etc.”

Page 271, 11a., after “var. STRIATA” begin new paragraph with “Lamarck, etc.”

Page 282, 27a., after “var. BELLADONNA”, begin new paragraph with “L. Sp. Pl. etc.”

Page 283, 27c., for “PLENA” read “SEMIPLENA”

Page 283, above 2nd line from bottom, insert, *“Amaryllis belladonna* var. *semiplena forma albertii* (Lemaire) Traub, *comb. nov.* Syn.—*Amaryllis albertii* Lemaire, Illus. Hort. pl. 498. 1866.”

Page 290, 36a., after “var. PSITTACINA” begin new paragraph beginning with “Ker-Gawl., etc.”

Page 291, 37a., after “var. CORREIENSIS” begin new paragraph, beginning with “Bury, etc.”

Page 296, 45a., after “var. RETICULATA”, begin new paragraph, beginning with “L’Hérit., etc.”

DUKE HORTICULTURAL CENTER

The Horticultural Society of New York, which was founded in 1902, has agreed to administer on behalf of the Duke Gardens Foundation, Inc., the project to be ''devoted to research and to agricultural, botanical and horticultural exhibits, open to the public.'' The project will be located on 60 acres of the Duke Farm property two miles from Somerville, New Jersey, and 35 miles from New York City.

Headquarters for the Horticultural Society of New York and Duke Gardens Foundation, Inc. will be at the Essex House, 157 West 58th Street, New York 19, N. Y.

SUBGENERA OF **BRUNSVIGIA** HEIST.

Hamilton P. Traub

A few who are not acquainted with the biologic facts have attempted to keep the Cape Belladonna, *Brunsvigia rosea* (Lam.)Hann., separate from the genus *Brunsvigia* Heist., but this can never succeed so long as taxonomy is a science. It has been shown that the Cape Belladonna is so similar morphologically to other *Brunsvigia* species that even he who runs can see the close similarity. In addition, the chromosome number of *B. orientalis,* the type of the genus, is the same as that of the Cape Belladonna, *Brunsvigia rosea* (Lam.)Hann., 2n=22, indicating a basic number of x=11. It is not surprising therefore that there is gene exchange between the Cape Belladonna and some other *Brunsvigia* species. Such crosses have given fertile offspring, and abundant examples of such fertile hybrids in various generations after the first crosses can be found in gardens in many parts of the world (see Traub & Moldenke, Amaryll. 56-67. 1949; Gouws, in Plant Life *5:* 65. 1949; Traub, Amaryllis Manual, 236-251. 1958; Hannibal, in Herbertia *9:* 101-102; 146. 1942 (1943); in Plant Life *11:* 67-75. 1955; *13:* 92-99. 1957).

Genus **BRUNSVIGIA** Heist

in Monogr. cum ic. 1753 & 1755; Ait. Hort. Kew, ed. 2 (1811), Traub & Moldk., Amaryll. 66-67. 1949; Dyer, in Plant Life **6:** 63-83. 1950; **7:** 44-64. 1951; Traub, Amaryllis Manual, 246-249. 1958. Type species: **B. orientalis**(L.)Ait. et Eckl.

In the genus **Brunsvigia** there are two natural sub-groups, one centering around **B. rosea** (Lam.) Hann., the Cape Belladonna, with leaves ascending when young; and the other, centering around **B. orientalis,** with leaves soon spreading prostrate on the ground.

Subgenus 1. **COBURGIA** (Herb.) Traub, **comb. nov.**

syn.—Genus **Coburgia** Herb., in Bot. Mag. Lond. **47:** sub pl. 2113, pp. 4-5. 1819.

DIAGNOSIS.—Leaves 8—20, ascending when young, and only spreading on the ground with age. Type: **B. rosea**(Lam.)Hann., in Herbertia **9:** 101-102; 146. 1942 (1943). Additional species: **grandiflora** Lindl., **undulata** Leighton, **josephinae** (Red.)Ker-Gawl., **litoralis** Dyer.

Subgenus 2. **BRUNSVIGIA**

DIAGNOSIS.—Leaves 2—6 (rarely up to 8), soon spreading prostrate on the ground. Type: **B. orientalis**(L.)Ait. ex Eckl., Trop. Verz. 7. 1827. Additional species: **radula** Ait., **comptonii** Barker, **Bosmaniae** Leighton, **appendiculata** Leighton, **minor** Lindl., **striata** Ait., **gregaria** Dyer, **natalensis** Baker, **radulosa** Herb.

Some of the exhibits at the Amaryllis Show sponsored by the Men's Amaryllis Club of New Orleans, April 12 & 13, 1958.

Plate 2

1. REGIONAL ACTIVITY AND EXHIBITIONS

1958 AMARYLLIS SHOW SPONSORED BY MEN'S AMARYLLIS CLUB OF NEW ORLEANS

When it became evident that due to the damage done to the *Amaryllis* by the cold weather of the late winter and early spring of 1958, the usual large Official Amaryllis Show could not be staged by the Garden Circle and cooperating societies and clubs, the Men's Amaryllis Club of New Orleans volunteered to stage a smaller show. This was done with the cooperation of the Garden Circle.

The first Amaryllis Show sponsored by the Men's Amaryllis Club of New Orleans, Louisiana, was held April 12 & 13, 1958 in the Bienville School, 1456 Gardena Drive, and was staged by Mr. W. J. Perrin, Chairman, in a most beautiful manner. It was a grand success.

Those in charge of entry classifications were: (a) Dutch hybrid class, Mr. Tim Calamari; (b) American hybrid class, Mr. S. P. Gasperesz, and (c) specimen class, Mr. Charles A. Ramelli. This work was performed in an excellent manner. (Plate 2).

The entries were of high grade and much better than anticipated in view of the unusual cold weather in late winter and early spring.

The Gold cup was won by Mr. Milo C. Virgin for Dutch named clones, and the Gold cup for American clones was won by Mr. Andrew C. Gandolf, Jr.

The sweepstakes awards went to Mr. S. N. Cushinotto in the Dutch Hybrid class, and to Mr. Walter R. Latapie and Mr. Charles Ramelli, in the American Hybrid class.

Ribbon awards were also made in all classes to first, second and third winners. The Show was judged by five Official Accredited Amaryllis Judges.

W. D. Morton, Jr.

ANNOUNCEMENT — 1959 OFFICIAL NEW ORLEANS AMARYLLIS SHOW

MRS. W. J. PERRIN, *President, Garden Circle*

The Garden Circle's Tenth Official Amaryllis Show was scheduled for March 22-23, 1958 and plans for a bigger and better show were well under way when continual freezing spells throughout the winter months were climaxed by a severe snow-storm on February 15, the first in fifty years. The effects of this on the *Amaryllis* prompted us to call a special meeting on February 24th to discuss the practicability of staging a large show in 1958.

One of the main attractions of the show is the arrangements division. Each year there are approximately a hundred beautiful *Amaryllis* arrangements, and we had no idea how the outdoor *Amaryllis* would bloom under the conditions. These outdoor clones and seedlings, which are usually utilized for the arrangements, would apparently not be available. With these facts in mind, and because of the magnitude of the show, open for competition to the general public as well as the garden club members, it was considered advisable to cancel the 1958 Show. So many categories were involved—horticulture (Dutch and American clones), arrangements, special schedules, invitations, etc., that the members felt that this step was necessary.

Plans for a bigger and better Official Amaryllis Show in 1959 are well under way at this writing (December 1958). This will be the Garden Circle's tenth Official Amaryllis Show, and it is scheduled for March 21-22, 1959 at McMain Junior High School, 5712 South Claibourne Avenue.

Many new features are planned. There will be two new classes, one for registered named Dutch clones and one for registered named American clones. There will be additional Awards of Merit from the American Amaryllis Society.

A new award this year for the most blue ribbons in American Horticulture will be the La Forest Morton Memorial Trophy, in honor of the late Mrs. W. D. Morton, Jr., who was prominent in gardening circles here and did so much to promote interest in *Amaryllis.*

The new Harry St. John Memorial Challenge Trophy will be awarded for the most outstanding American Specimen. A Harry St. John Bulb was sent to the White House in 1956 and Mrs. St. John (a Garden Circle member) has a letter from Mrs. Mamie Eisenhower expressing appreciation of same, and stating that it was planted in the Gettysburg Garden.

For the first time, too, the Men's Amaryllis Club of New Orleans Trophy will be given for the most outstanding Dutch Specimen in the show. There are many other cups and ribbons to be awarded.

One of the highlights of the show will be the lovely ceremony of the crowning of the Amaryllis Queen. In addition, this year there will be a charming "Amaryllis Dance" by the children of Kingsley House.

We are looking forward to many beautiful artistic arrangements (of Amaryllis only), and of course numerous horticulture specimens, a class open to the general public.

HATTIESBURG (MISS.) AMARYLLIS SOCIETY

Mrs. Sam Forbert writes that the first Official Amaryllis Show of the Hattiesburg Amaryllis Society will be held some time in April. A report on this event will be included in the 1960 Herbertia.

Mrs. Forbert reports that color slides of Amaryllis hybrids were shown at their Sept. 11, 1958 meeting. Many of these were shown through the kindness of Mr. James Terry, and Mrs. U. B. Evans who kindly lent their color slides.

AMARYLLIS SOCIETY OF MOBILE

Mrs. Hunter Kilpatrick, *Secretary,*
Mobile, Alabama

The members of the Amaryllis Society of Mobile have had many interesting experiences in the growing and cross pollination of both American and Dutch hybrid *Amaryllis.* Here in our area many people grow all their amaryllis in the ground the year round. In Winter the bulbs are heavily mulched with pine straw or oak leaves.

The crossing of the Dutch and American hybrid *Amaryllis* has become the greatest interest of many of our members. One of the most interesting crosses we have is 'Sweet Seventeen' x 'Barbados'. The flower of this cross resembles ''Sweet Seventeen' in size and color and the 'Barbados' in shape.

AMARYLLIS ROUND ROBIN NOTES, 1958

Mrs. Fred Flick, *Chairman,*
Amaryllis Round Robins, Carthage, Indiana

[The following notes were extracted from Round Robin letters by Mrs. Fred Flick, who is Chairman of the Amaryllis Round Robins.—Editor]

SUBJECT:—SOIL MIXES FOR AMARYLLIS BULBS

MADGE TEBBEN, ILLINOIS:—Good friable garden soil 50%; sand, about 15%; humus, 10%; old decayed stable manure, about 25%.

Recently I have used a mixture called Ferti-Life. It is made of live stock manure and compost from the Chicago Stock Yards. It is recommended to use this in the proportion of one tablespoon to each inch of diameter of the pot that you are going to use, so a six inch pot would take six tablespoons full. I use this now instead of the humus and decayed stable manure. I still use plenty of sand and I give each a bit of horticultural lime, as our soils are so acid along Lake Michigan. I use about one teaspoon to a pot.

EUNICE FISHER, WISCONSIN:—I use compost with one-third sand.

BEN HONFELD, CALIFORNIA:—(bulbs grown outside) I use compost and cow manure mixed with soil.

EVALENA CREWS, ARKANSAS:—One third sand; one third garden soil; one third black peat; to the above I add some well rotted barnyard manure and a good sprinkling of bone meal.

RICHARD GUERDAN, MISSOURI:—To a sack of three cubic feet of fir bark, I add a four inch pot each of pulverized limestone, superphosphate, and hoof and hornmeal. You can substitute a slow acting nitrogen fertilizer for hoof and hornmeal. Then to secure maximum growth, you can fertilize once a month during the growing season with any well balanced liquid fertilizer.

LYDIA PAHLS, FLORIDA:—(Bulbs planted outside). The soil here is quite sandy, somewhat alkaline and full of coral rock. We take out the rock and some of the subsoil; and add well rotted compost. Then we add a small quantity of the commercial dry sheep manure and superphosphate. The resulting mix is still fairly sandy. Because of our heavy rains, good drainage is important, and we rely on periodic fertilizing during the growing season, to keep the bulbs well fed.

HELEN ELIAS, CONNECTICUT:—We have in our back yard, four separate heaps of compost, 10 x 4 feet in various stages. Into these heaps we put all kitchen vegetable rejects, green weeds, faded flowers, leaves from the yard, grass clippings, and on rare occasions, a dressing of cow manure. This stands for about a year and a half before we screen it through a coarse screen, to remove stones and sticks. This material has a crumbly, velvety feeling and is given just enough sand to insure good drainage, about one shovel of sand to ten of compost. To a wheelbarrow of soil, I add about ½ shovelful of bonemeal and ½ shovelful of 4-10-10 fertilizer. I store this mixture in drums in the garden house for winter and early spring use.

For the summer, the bulbs are turned out of their pots into the vegetable garden. For their dormant season, they are potted and kept in a medium warm cellar until the middle, or end of January, with only one or two scant drinks of water.

LEN WOELFLE, OHIO:—Each spring I try to make a trip into the local woods to get several gallons of rich, humusy woods soil. In this I pot most anything that needs potting earlier than garden time. I find seeds of amaryllis, sprekelia, lilium, and zephyranthes germinate wonderfully well in this soil.

OPAL R. FLICK, INDIANA:—For several years all my amaryllis bulbs have been potted in a commercial mix, Black Magic. This is a loose mix, and therefore gives perfect drainage. This summer, I have potted a few amaryllis in woods compost, as Len recommends.

EDITOR'S MAIL BAG

Mr. W. Morris, 20 Mills St., Warners Bay, New South Wales, Australia, writes under date August 18, 1958, that it is difficult to import bulbs due to quarantine regulations, and that he ''would appreciate contacts with enthusiastic amateurs who might be interested in exchanges of seeds''. He states that he has over 150 species of bulbs, not counting liliums, narcissi and irises, and that he has a particularly good lot of South African bulbs.

Mr. Zvi Ginsburg, of Gevim, Doar-Na, Hof Ashkelon, Israel, visited the writer in the latter part of August. He has promised to send bulbs of *Vagaria parviflora*, *Pancratium maritimum*, ''*Sternbergia spofforthiana*'', *S. lutea*, *Ixiolirion montanum*, and *Pancratium sickenbergii* if, and when he encounters them in their native habitat in Israel.

Mr. David James William Chandler, the Australian nurseryman, died on August 23, 1955. The late Mr. Chandler's business is being carried on by his nephew, Mr. T. H. Chandler, of Como Nurseries, The

Basin, Victoria. The executors of the estate write that ''Unfortunately, a great deal of the late Mr. Chandler's specialized knowledge has died with him.''

An interesting article on preserving flowers by embedding in sand by Mrs. Geneal Condon, ''Blossoms that Defy the Seasons'' was included in the National Geographic Magazine, CXIV: 420—427. 1958. This gives experiences with a new version of the old method of drying flowers by embedding the fresh flowers in sand.

Our colleague, Dr. Harold N. Moldenke, Director of the Trailside Museum in Westfield, N. J., has been chosen leader of the ''Gardens of the Bible'' Tour scheduled to leave from New York March 26, 1959 via American Airways. Highlights of the tour include visits to Israel, Jordan and Egypt as well as Italy. Further details may be obtained from Dr. Moldenke, or from the Horticultural Travel Foundation, Hotel Chatham, New York City.

Mr. L. S. Hannibal writes that ''With the rather sudden passing of Mrs. A. Primo of Mobile, Ala., in January of 1957 one of the finest *Crinum* collections in the country ceased to be available to members of the American Amaryllis Society. Many of her thousands of subtropical bulbs were either unlabeled or the labels were so illegible that identification has been impossible. As a consequence the members of her family have not been able to continue the business. We regret to learn of this for this was a collection representing years of work. Her passing represents a deep and sincere loss to the society.''

Dr. K. N. Kaul, Director of the National Botanic Garden, Lucknow, India, writes under date of Nov. 4, 1958, that Mr. Sydney Percy Lancaster, formerly of the Agri-Horticultural Society of Alipore, India, and more recently with the National Botanic Garden, Lucknow, is leaving India early in 1959 to reside in Southern Rhodesia with his sons.

We have learned that the Society's good friend, Robert T. Van Tress is still with the Chicago Park District as Horticulturist, and is now also Garden Editor with the Chicago Daily News. It was Mr. Van Tress who introduced the fine strain of Garfield Park hybrid Amaryllis in the 1930's through the agency of the American Amaryllis Society. (See Traub—The Amaryllis Manual, page 37, illustration 16 (page 38), and page 77.)

Under date of November 4, 1958, from Cochabamba, Bolivia, Prof. Ira S. Nelson writes that on his way to South America on the plant exploration trip he stopped off at Panama City. There he ''checked on Richard William Pearce (1838?—1867) at the British Consulate to find, if possible, the site of Pearce's grave, and any other available information about him, but the records date back only to 1869, and Pearce died two years earlier.'' (See Traub—''The Amaryllis Manual'', pp. 43—44.)

Messrs. Arthur E. Teeter and W. F. Sinjen of San Diego, Calif. visited the writer on December 13, 1958. Mr. Teeter is an educator who works with amaryllis as a hobby, and Mr. Sinjen is a landscape artist who uses amaryllids in his profession whenever they can be used to advantage.

Dr. Mason M. Turner, Modesto, Calif., of the Agricultural Research Division of the Shell Development Company, visited the editor in early January. Dr. Turner is much interested in *Amaryllis* species and hybrids as an avocation.

Mr. John M. Cage, 740 Arroyo Road, Los Altos, Calif., has been breeding *Amaryllis* for the past quarter century, and he has promised to write an article on his breeding experiences for publication in the 1960 AMARYLLIS YEAR BOOK, the 27th edition. We will all be looking forward to this treat.

We congratulate Mr. Douglas D. Craft, of the DEPT. OF DESIGN, ART INSTITUTE OF CHICAGO, and Artist for the Society, who has had one of his paintings selected for the National Show at the RINGLING MUSEUM OF ART, in March 1959.

AMARYLLIS JUDGES CERTIFICATES

Since the last report in 1958 Amaryllis Year Book (page 25), the following Amaryllis Judge's Certificates have been issued by the American Amaryllis Society:

38. Mrs. Guy Rice, 606 Gornto Road, Valdosta, Georgia.
39. Mrs. Jo Beatrice Wells, 5497 Holly Springs Drive, Houston 27, Texas.
40. Mrs. H. J. Strong, 619 Pinehaven Drive, Houston 24, Texas.
41. Mrs. Frank S. Bova, 812 West Temple, Houston 9, Texas.
42. Mrs. E. L. Bachelor, 2417 Morse, Houston 19, Texas.
43. Mrs. Amesbury Lee, 2314 Kipling #50, Houston, Texas.
44. Mrs. Creel Brockman, 152 West Texaco, West Columbia, Texas.
45. Mrs. R. M. Langford, Tifton, Georgia.
46. Mr. Guy Rice, 606 Gornto Road, Valdosta, Georgia.
47. Mrs. J. A. Fausette, Adel, Georgia.
48. Mrs. Wayne Wiseman, Adel, Georgia.
49. Mrs. T. U. Hill, Tifton, Georgia.
50. Mrs. Lamar Devane, Adel, Georgia.
51. Mrs. Dan Redd, Thomasville, Georgia.
52. Mrs. Ritchie Ross, Thomasville Road, Tallahassee, Florida.
53. Mrs. Johnie George, 309 E. Alden Ave., Valdosta, Georgia.
54. Mrs. Ashley McLeod, 1518 McLeod Road, Valdosta, Georgia.
55. Miss Kathryn Ulmer, South Patterson Street, Valdosta, Georgia.
56. Mrs. H. M. Paulk, Tifton, Georgia.
57. Mrs. William Culpepper, 217 W. Alden Ave., Valdosta, Georgia.
58. Mrs. O. S. Ware, 2001 Slater Street, Valdosta, Georgia.
59. Mrs. D. L. Gill, 511 West 20th St., Tifton, Georgia.
60. Dr. D. L. Gill, 511 West 20th St., Tifton, Georgia.
61. Mrs. Dwight M. Knight, 506 West 10th St., Tifton, Georgia.
62. Mrs. W. A. Hodges, Tifton, Georgia.
63. Mrs. W. S. Wheeler, 4506 Bellaire Blvd., Bellaire, Texas.
64. Mrs. E. O. Greiner, 3202 Hurley Road, Houston 16, Texas.

For information about taking the examination for the Amaryllis Judge's Certificate, write to Mr. W. D. Morton, Jr., 3114 State Street Drive, New Orleans 25, La.

APHIDS ON HEMEROCALLIS

Aphids appear in the "hearts" of the growing fans of *Hemerocallis* during the winter and spring at La Jolla, Calif. They very rarely arrest the growth of the plants. Winter rains, if any, do control them. During rainless periods overhead watering proves effective.—*Hamilton P. Traub*

2. SPECIOLOGY

[EVOLUTION, DESCRIPTION, CLASSIFICATION AND PHYLOGENY]

CRINUM GRAMINICOLUM

Reg. F. Harradine, *England*

Those who have this plant and have not yet seen it in flower, have a rare treat in store for themselves. I have some thirty *Crinum* species and varieties and about half of them have shown me their flowers. I find them all rather lovely, but when this one unfolded its glorious flowers, I just gazed at it, quite amazed that such a beautiful thing could be a 'wild plant'.

Two years ago I received from Northern Transvaal, six huge, dark brown bulbs, the largest of them being some 6 inches in diameter, almost globular and weighing nearly eight pounds—much like a mangold. I gave away four of the bulbs, all of which have been lost. My two are in fine shape and the large bulb favoured me with a bud early in August. This developed very quickly, throwing up a thick stem about 10 inches high, crowned with a spathe 2 inches broad and 4 inches long. This opened up into an umbel of 14 buds which developed into flowers in a surprisingly short time, so that when the last opened the first flower was just beginning to fade, thus giving a circlet of flowers some 14 inches in diameter. As with many Crinums, the pedicel is short, less than 1 inch, the perianth-tube long, about 5 inches, arched over to hold the flower horizontally. Segments keeled deep reddish rose, fading out to the margins which are nearly white. All segments are about 4 inches long, the outer about ¾ inch wide, the inner about 1 inch wide. The flower is trumpet shaped, the segs recurving at the top, which is tipped with green. Stamens are declinate and upcurving. Anthers versatile, ⅜ inch long, ash-grey turning black.

The plant is low growing, the leaves, from a short neck, dark grey-green, 5 to 6 inches in the broadest part, which is about 9 inches from the neck, some 24 inches in fullest length, spreading, curling and falling around sides of pot. Leaves edged with fine white hairs.

As soon as the flowers have faded, the peduncle falls to the ground. In this position, the ovaries begin to swell and as the fruits develop, they look like a bunch of small cucumbers. On my specimen all 14 ovaries are swollen with seeds.

I feel that the above description does not do justice to this lovely species. It is illustrated in Flowering Plants of Africa, Part 116, Sept. 1953, Plate 1155, and the accompanying account states that this species has, for some time, gone under the name *Crinum forbesianum*, but is now considered to be quite distinct from that species, which apparently came from Portuguese East Africa. It further states that *Crinum graminicolum* is frequently found around Pretoria and neighbouring districts, scattered over small areas, in dense sour grass veldt.

102 Byng Drive,
Potters Bar, Middlesex, England

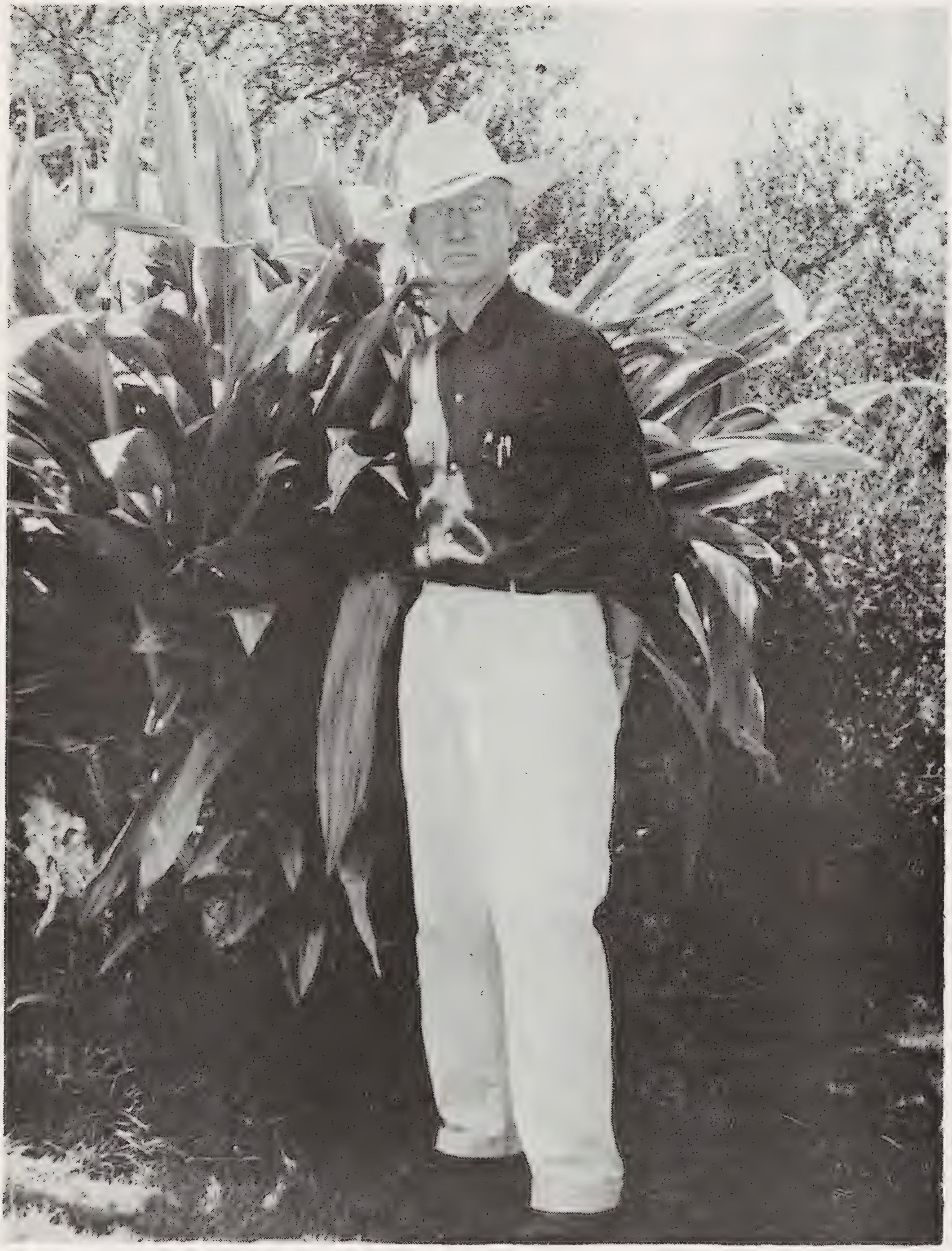

Fig. 1. Dr. Thomas W. Whitaker standing beside an unusually large clump of *Crinum moorei* Hook f. Note the extreme height and lush growth of the plants. Photo by G. A. Sanderson.

AN UNUSUALLY LARGE SPECIMEN OF **CRINUM MOOREI**

The clump of *Crinum moorei* Hook. f., plants in the accompanying photograph are growing on the grounds of the U. S. Horticultural Field Station at La Jolla, California. Four small bulbs were planted in a circle about 6 inches apart in 1939. At the present time the plants are over 6 feet high, the clump is about 4 feet in diameter, and consists of about 30 bulbs (Fig. 1). A search of the available literature indicates these are some of the largest plants recorded for this South African species of *Crinum.*

The plants have a tendency to become defoliated in late summer and early fall when the scape begins to elongate and the umbel commences to expand. Often there are as many as a dozen, large, attractive pinkish-white flowers in the umbel of each scape. An occasional scape may appear in the spring, but most of them are produced in the fall.

The clump is located in half-shade under the branches of a black walnut tree. No special effort has been made to provide additional water or nutrients other than that received by the adjacent lawn and nearby plants of the Cape Belladonna, *Brunvigia rosea.—Thomas W. Whitaker.*

TWO NEW DIPLOID DAYLILIES

HAMILTON P. TRAUB, *California*

THE 'MARY BEVERLEY' DAYLILY

On July 13 the writer visited Dr. Thomas W. Whitaker of La Jolla, California, and he had the opportunity of seeing for the first time one of the most spectacular diploid daylily hybrids produced by Dr. Whitaker. The outstanding characters of this clone are (a) the very large fragrant, sunfast Canary Yellow (2/1) self colored flowers which were unfaded at 4 p. m. when the writer saw them (they should be even better in the East and North); and (b) the fact that the clone is recurrent in blooming habit. The first blooms were produced in early summer and now in the middle of July the second flush of bloom had appeared.

The clone is tall and there are up to 20 or more flowers per scape. The tepaltube is one inch long; the petsegs 6 inches long, 1⅞ inch wide; the setsegs are 5½ inches long, 1½ inch wide. When the tepalsegs are spread out the flower is 7½ inches across the face of the flower, but the tepalsegs are slightly recurved and thus it is actually 6½ inches across as it appears on the plant.

The clone has been named 'Mary Beverley' (Whitaker, 1959) for Mrs. Thomas W. Whitaker (Mrs. Mary S. Whitaker). The clone will be distributed in due course.

THE 'EMPIRE YELLOW' DAYLILY

On August 24, 1956, Prof. Ira S. Nelson and the writer visited the home of Dr. Thomas W. Whitaker at La Jolla, Calif., and were both charmed with a new daylily in bloom in his garden. The plant is tall, making a vigorous clump. The well-branched scapes each have up to 30 or more flowers which are fragrant, sunfast Empire Yellow (603) selfs. The perigone is wide open—5 inches across the face. The margins of the tepalsegs are ruffled and they are somewhat reflexed. The tepaltube is 2.5 cm. long. The setsegs are 9.5 cm. long, 3.4 cm. wide; the petsegs 10 cm. long, 5 cm. wide. The plant is recurrent blooming at La Jolla, Calif. *Hemerocallis* clone 'Empire Yellow' (Whitaker, 1959).

THE 'GEORGE GILMER' DIPLOID DAYLILY

Hamilton P. Traub, *California*

The writer has reduced the extent of his efforts to breed diploid daylilies but he is still attempting to breed diploids with greater resistance to adverse weather conditions—heat, drying winds, etc. Up to the present some fine yellows in this class have been obtained. The most notable of these (Fig. 2) is the one that has been named in honor of Mr. George Gilmer of Charlottesville, Virginia. It has been tested for a number of years here at La Jolla, California, and at Charlottesville, Virginia. The color is a rich saffron yellow self (HCC 7 to 7/1). The color is different but in general habit it can be contrasted with 'High Noon' (indian yellow HCC 6). 'George Gilmer' has a more refined flower.

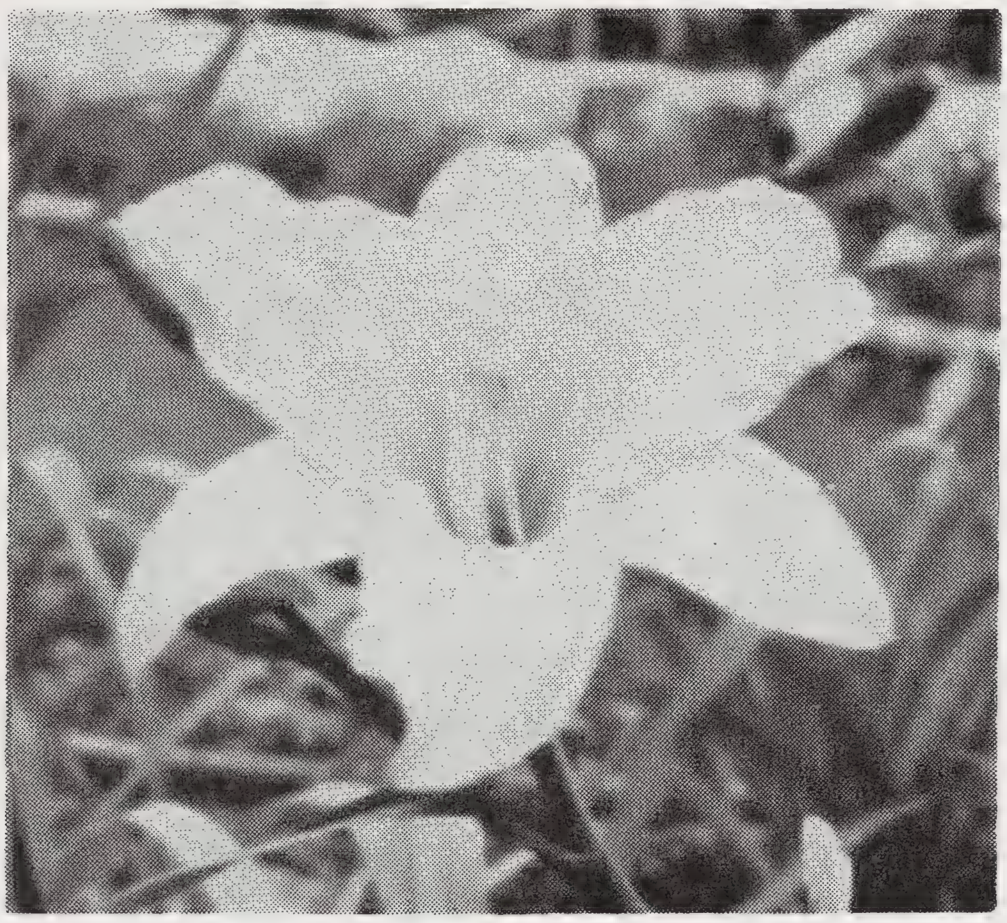

Fig. 2. Diploid daylily hybrid—clone 'George Gilmer' (Traub, 1959), rich saffron yellow, refined in form.

The description of the 'George Gilmer' daylily follows:

Plant 28″ or more tall; 36 or more flowers per scape; pedicels

6-7 mm. long; flowers wide open, 6½″ or more across face, tepalsegs slightly creped and distinctly ruffled on the margins, refined thick texture; delightfully fragrant, flower color sunfast, a rich saffron yellow self (HCC 7 to 7/1), setsegs elliptic, 4½″ or more long, 1½ or more wide, apex acutish to roundish; petsegs obovate, 4¼″ or more long, 2½″ or more wide, apex rounded; style rather slender, about 3—3.8 cm. shorter than petsegs, stigma small, whitish; stamens rather slender, 1—1.8 cm. shorter than the style; anthers grayish before opening, 7 mm. long, pollen orange yellow. Evergreen, recurrent blooming in California from June to October; fair propagator.

SOME OUTSTANDING DAYLILIES, 1958

George Gilmer, *Virginia*

If you miss a favorite breeder of your pet plants please remember that with some 700 new hemerocallis a year I am only able to try about one in 20 and of over 50 active breeders I can sample the product of but a few. By careful selection I get about 80% of the award winners and those rated most popular.

Few varieties are not surpassed in five years and scarcely any are at the top ten years after introduction. An exception is ‘Judge Orr’ introduced in 1939. I know of no better early variety. It is my first in the spring. It has good color and fragrance. Its size and shape are not to be compared with midseason varieties. I know nothing as good within three weeks of the time it starts. It has a full second crop beginning in September and lasting until killed by freezing weather in November.

‘California’ and ‘Richard’ both introduced by Norton in 1948 are among my best late bloomers. ‘Valesca’ (Craig) is valuable for its lateness.

I wish more breeders would work for good early and late bloomers, those that repeat and to extend the life of the individual bloom. Flowers on some new varieties cover twice as long period as those of thirty years ago. But it is still a long way before they have a flowering season as long as their cousins the Amaryllis or roses and iris.

A white hemerocallis is much sought. Many of the palest have wilted and curled in the sun. ‘Silver Sails’ (Connell) holds up well and is nearest to white I have seen. ‘Marguerite Fuller’ (Kraus) ‘Powder Puff’ (Lester) and ‘Evelyn Russell’ (Russell) are three good light yellow.

‘Pink Dream’ (Childs 1951) was the best pink I knew seven years ago. ‘Lyric’ (Childs 1955) is far better. ‘Evelyn Claar’ (Kraus) is the pink highest in the popularity poll. It is one of the best. Other good pinks are ‘Daffu’ and ‘Tootie’ (Claar), ‘Coral Mist’ and ‘Imperial Blush’ (Hall), ‘Ruth Lehman’, ‘Nina Rebman’, ‘Elegy’ (Kraus) are melon pinks with yellow. ‘Bon Bon’, ‘Cara Mia’, ‘Picture’ and ‘Garden Sprite’ (Lester) are good. ‘Mystic Pink’, ‘Pink Ruffles’ and ‘Alice Russell’ (Russell), (the last is a melon pink and one of the loveliest I have seen), are all good.

'Adelaid Nieland', 'Crinoline', 'Flirtation Pink', 'Gallantry' (Taylor) are among the best pinks.

'Neyron Rose' (Kraus), 'Cherokee Rose' and 'Lilibet' (Lester) are tops in the rose class. 'Sunset Sky', 'Salmon Sheen', and 'Vision' (Taylor) and 'Fairy Wings' (Lester) are good pink and yellow blends.

Lavender is being developed in 'Selena Bass' and 'Quincy' (Taylor). But the outstanding one, 'Captain Russell' is a bicolor with wide light lavender petals and narrow cream sepals. It is the most distinctive daylily I have seen. It catches the eye from a distance and is lovely close-up.

The purest red in my garden is 'Citation' (Taylor). It repeats. Other good reds are 'Harriet Mann' (Taylor), 'Courage', 'Polished Jewell' (Craig), 'Addred' (Culpepper), 'Fairbow', 'Woodrose' (Kraus), 'Black Friar' and 'Revelry' (Lester), 'Black Absolute', best dark red (Milliken), 'Garnet Robe' (Milliken).

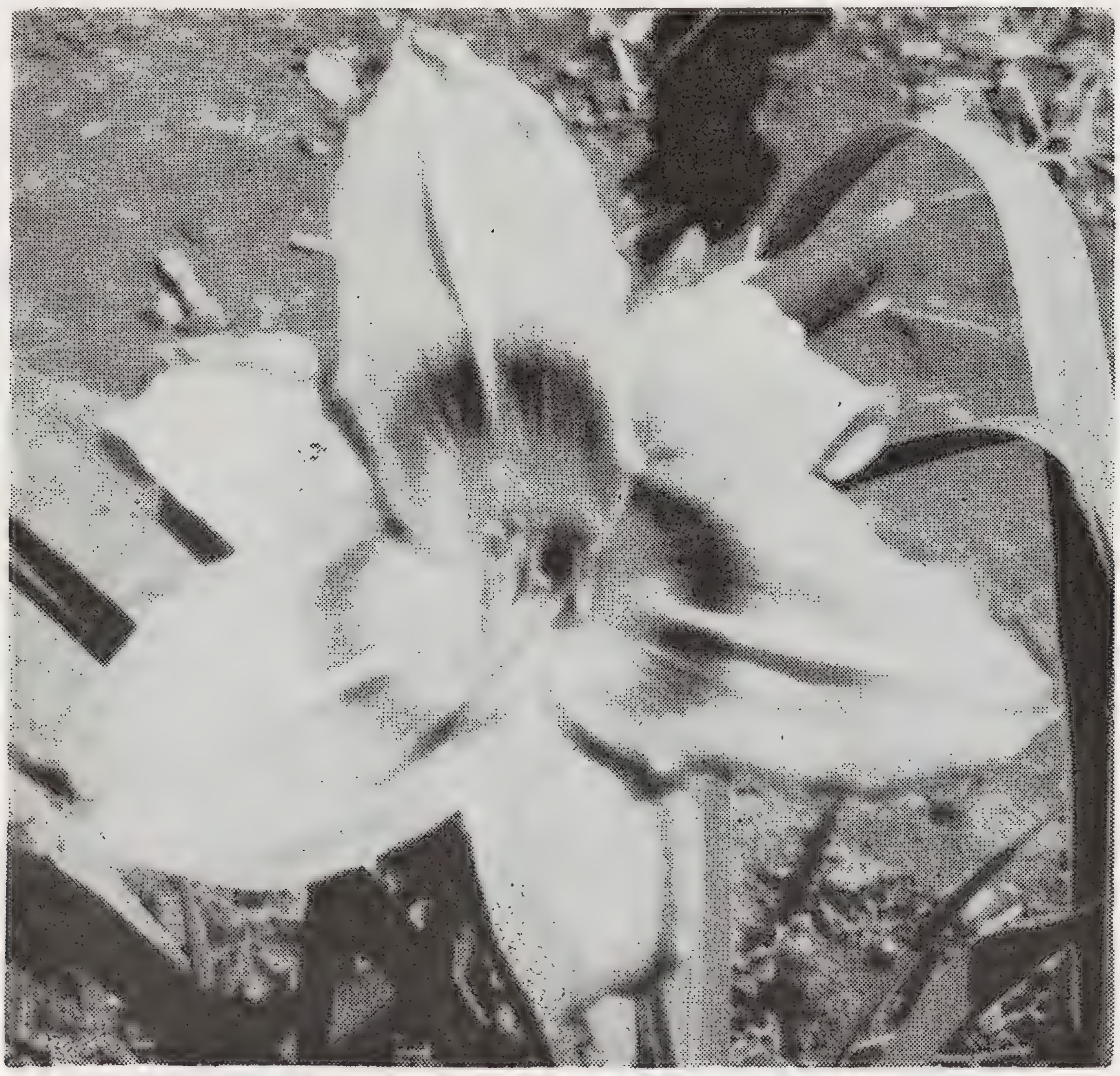

Fig. 3. *Hemerocallis washingtonia,* the tetraploid daylily—clone 'Wyndham Hayward' (Traub, 1959), brilliant tangerine orange (HCC-9/1) with reddish eye-zone.

Flory is putting out some fine new ones. 'Florence Clary' should replace 'Jesse Shambough'. 'Frans Hals' is an improvement on 'Monteray', and 'Mollie Gloye' is a great advance over 'Gay Lark.'

At the Washington, D. C., regional meeting I was most impressed by 'Chetco', 'President Rice' and 'Bess Ross.'

This article is just one man's opinion about the best Hemerocallis. For an excellent list of 100 best daylilies see Hemerocallis Journal 1958 year book issue page 130.

THE 'WYNDHAM HAYWARD' TETRAPLOID DAYLILY

HAMILTON P. TRAUB, *California*

The diploid *Hemerocallis* clone 'E. W. Yandre' was treated with colchicine and thus the tetraploid, 'Tetra Yandre' (1958) was obtained a few years ago. This clone was selfed and 27 seedlings were obtained. The color of the flowers of these selfs ranged from tangerine orange to lighter orange and yellow, all with reddish eye-zones. One of these was particularly outstanding (Fig. 3) and it was named for Mr. Wyndham Hayward, the originator of the original diploid clone 'E. W. Yandre', which represented a land mark in the development of the hybrid diploid daylilies. It has particularly wide tepalsegs.

The description of *Hemerocallis washingtonia* clone 'Wyndham Hayward' follows:

Plant 18″ or higher; 12 or more flowers per scape, bracts greenish-whitish, aerial offsets sparingly formed; flowers almost sessile, wide open, 6½ to 7 inches across face, spicely fragrant; color near brilliant tangerine orange (HCC 9/1), with bright reddish eye-zone on petsegs, and very faint zone on setsegs; tepalsegs creped, margin ruffled; tepaltube 1.6 cm. long, 1.1 cm. in diam.; setsegs narrowly elliptic, 4″ (10.2 cm.) long, 1½″ (3.8 cm.) wide, apex acute; petsegs elliptic 4½″ (11 cm.) long, 2⅛″ (5.4 cm.) wide, apex acutish; style 2 cm. shorter than petsegs; stamens 3 cm. shorter than style; anthers grayish before opening, pollen orange yellow. Evergreen, recurrent blooming. Holotype: No. 631 (TRA), *Hemerocallis washingtonia* clone 'Wyndham Hayward', 6-1-58, La Jolla, Calif.

OLD AMARYLLIS CLONES

WYNDHAM HAYWARD, *Florida*

Old-time Hybrid *Amaryllis* clones have been unfortunately of short and fleeting life, with the possible exception of two or three forms, which are still in cultivation after a varying number of years:—*Amaryllis* x *johnsonii, Amaryllis* x *acramanii* and *Amaryllis* 'Mrs. Garfield.'

Amaryllis x *johnsonii* was described by the author in a previous HERBERTIA (1951-p. 38-40) and illustrated there from plants collected in Louisiana gardens where the bulb is known as ST. JOSEPH'S LILY. It is found scatteringly over the South from Texas to Florida, growing in established gardens, seldom or never naturalized, but giving good results under a minimum of cultural care and attention.

There is some doubt today that the clone, type or form of *Amaryllis* x *johnsonii* found in Southern gardens is identical with the original as produced and distributed throughout Europe in the early 1800's, supposedly a hybrid of *Amaryllis reginae* and *A. vittata,* from the hand of a Lancashire watchmaker named Johnson. Plates of the plant appeared in several places in the early 1800's, as *johnsonii* (plate 1 in Mrs. Bury's "Hexandrian Plants", a famous color plate book), Redoute's "Les

Liliacees'', as *A. brasiliensis* (plate 469) and as *A. carnarvonia* in Al de Candolle's ''Pl. Rar. Hort. Genev.'' plate 9. (see Fig. 4 of present article.)

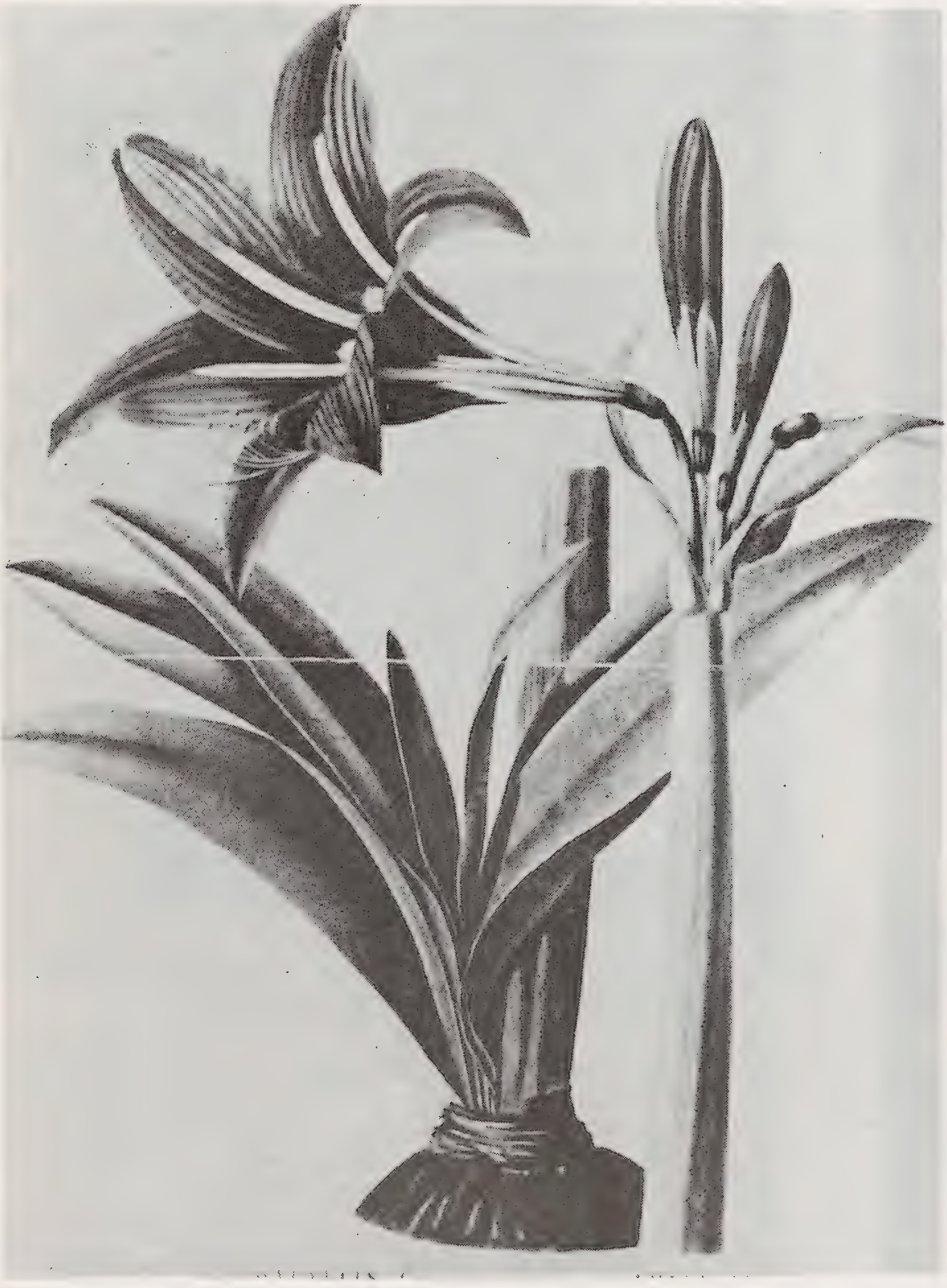

Fig. 4. *Amaryllis* x *johnsonii* (syn.—*Amaryllis* x *carnarvonia* A. C. de Candolle). Reproduced from Pl. Rar. Hort. Genev. Plate 9. 1799.

Amaryllis x *acramanii* is likewise available today from the firm of Van Tubergen in Holland. The author has grown this variety from

Van Tubergen bulbs for several seasons. In the Van Tubergen catalogue for 1955 *Amaryllis* x *acramanii (A. aulica* x *A. johnsonii)* is described as follows: ''nearly hardy deep crimson-red, funnel-shaped flowers in summer.''

Baker in his ''Handbook of the Amarylleae'' 1888, lists *acramanii* on page 53 under the ''forms nearest *aulicum''*. He also cites a form, *A. acramanii pulcherrima,* originally described in 1850.

As bloomed in Florida for several years, the Van Tubergen bulbs of *Amaryllis* x *acramanii* grow easily, in either pot culture in the lath house or in the sandy loam of the garden in full sun.

Weathers in ''The Bulb Book'', says (page 277) of *acramanii* that ''the color is crimson . . . the variety *pulcherrima* is figured in Moore. Bot. Mag. 1850, ii, 5; 'Chelsoni' (another named variety of the same type) in Floral Mag. t. 545, and other forms in same publication N. S. tt. 77, 167, 347 and 369.''

The above would indicate the general and comparative popularity of the *acramanii* form in the middle 19th century. This can be explained when one considers the Van Tubergen statement ''nearly hardy'', which would doubtless mean it could be grown in the South of England outdoors ''against a south wall'' or with other similar protection in winter. Also it must be considered that the fine large-flowered hybrids with wide spreading tepalsegs which evolved from *Amaryllis Leopoldii* had not yet come.

Dean William Herbert makes no mention of *Amaryllis* x *acramanii* in his ''Amaryllidaceae (1837) but cites a similar cross, which he calls *spofforthiae,* an ''aulico-carnarvoni'' cross (page 144) named from his parish seat, adding ''not yet blown!'' From this we can see that the custom of naming a flower before it came into bloom was a habit with early hybridizers.

It should be remembered that the early horticulturists had the usage of naming their hybrids with Latinized endings.

The Van Tubergen *acramanii* has handsome light green foliage, which goes dormant in late summer. The variety blooms in July faithfully in Florida, as it should, from its purported ancestry (a cross of spring- and fall-blooming types) *Amaryllis aulica* is the fall-blooming species, also available from Van Tubergen. It blooms in Florida in November and December, but has not demonstrated the garden stamina or staying power in the author's experience that *acramanii* has shown. The bulbs of *acramanii* outside and under lath, give an offset or two every two years, and would doubtless multiply into a good clump with proper care.

After several attempts at selfing, the *acramanii* seems completely sterile to its own pollen. Sometimes the seed pods swell, but they invariably shrivel and dry without forming seed to its own pollen. However, in the summer of 1955, one bulb of 'Shakespeare', a vivid oriental red to bright crimson Dutch variety (Ludwig & Co.,) happened to throw an out-of season bloom spike in mid-July when a second scape of

Amaryllis acramanii was in flower, too. Pollen of this 'Shakespeare', a fine modern, Dutch hybrid wide-petaled "self" of vigorous character, was applied on the two flowers of *acramanii* and they set seed. At least fifty or more seed were harvested from the mature pods in six weeks, and are being planted with care and trepidation.

This may be the first crossing of Amaryllis *acramanii* with a good type of modern named *Amaryllis* hybrid in the present century. The seedlings will be watched as it may mean a new race of summer blooming hybrids. Never previously has there been pollen from ordinary spring-blooming hybrid *Amaryllis* available in mid-July or early August to use on *acramanii.* The seed pods were large, of typical hybrid *Amaryllis* form, wide and flat, not long or slender. The development of a summer blooming line of *Amaryllis* with hybrid vigor and possibly improved hardiness to cold, is a dream to be followed closely.

Supporting the writer's experience, Herbert wrote (page 371): nine very fine crosses of *Amaryllis* "were flowering there at the same time . . . being desirous of blending again these plants which were all crossbred, different flowers were touched with pollen from their several neighbors and ticketed, and other flowers touched with their own pollen. Almost every flower that was touched with pollen from another cross produced seed abundantly, and those which were touched with their own, either failed entirely or formed slowly a pod of inferior size with fewer seeds." These crosses had *reginae, vittata, johnsonii, psittacina* and *elegans* blood in them.

The flowers of *acramanii* turn upwards at a slight angle, like those of *A. aulica.* They resemble aulica closely, but the time of blooming definitely separates them. The flower is long and tubular much like *johnsonii.*

In "Hortus Veitchii", a famous publication (1906) of the plants introduced and hybrids created by Veitch & Co., outstanding in English *Amaryllis* annals as introducer of *A. leopoldii,* which was found by their explorer Pearce in Peru, appear the following lines regarding *johnsonii:*

"A remarkable fact in connection with this hybrid, is the length of time it retained its character under cultivation and its potentiality with other species and varieties when used as a breeder, influencing the offspring to a great extent. . . . Amongst many hybrids . . . one may be singled out as of more importance than the rest. This received the name of *acramanii.*" (It was the result of a cross by Messrs. Garraway and Sons of Bristol in 1835 between *A. aulica var. platypetala* and *A. psittacina).* "It was named *acramanii* in compliment to G. Acraman, Esq., of Bristol."

"This was undoubtedly the finest hybrid yet raised, but a few years later was eclipsed by a seedling of the same firm, flowered in 1850, from *A. aulica* crossed with the hybrid *johnsonii,* and named *acramanii pulcherrima,* from a resemblance to the original hybrid."

The third veteran *Amaryllis* clone still available in the trade from Van Tubergen and for some curious reason, from Indian nurseries as well, is the fall-blooming *Amaryllis reticulata* var. *striatifolia* hybrid named 'Mrs. Garfield.' Henry Nehrling showed another *A. reticulata* hybrid in his book "Die Amaryllis" 1908, named 'Anna Jay', a fall-blooming clone like the parent.

This variety 'Mrs. Garfield' and the natural type of *A. reticulata* var. *striatifola* have the prominent white stripe or midrib of the leaves, a variety which M. B. Foster has collected in the wild in South America, and which will to some extent perpetuate itself in seedlings. The flowers are netted lavender on lighter background, and are very charming. Culture is difficult, in the author's experience in the open or under lath house conditions in Florida, but Foster finds it succeeds well and multiplies under glass.

H. F. MacMillan, in his popular classic of the warm climate horticulturist, "Tropical Planting and Gardening", London 1948, etc., depicts a handsome plant of the hybrid *Amaryllis* clone 'Mrs. Garfield' on page 132, and comments: "a distinct and exceptionally fine variety." The illustration shows the striped leaves characteristic of the form. For some unknown reason this variety has found the Indian climate suited to its needs and is sold in quantity by several nurseries there. In Florida the growth has been too slow and unthrifty outside to be satisfactory, but this may be due to cold damage to the bulbs in winter. Under glass they do not suffer this extreme of temperature outside which suits *acramanii* perfectly.

ZEPHYRANTHES X RUTHIAE

HAMILTON P. TRAUB, *California*

In 1958 Herbertia (page 55), Dr. Thad Howard of San Antonio, Texas, described a fine clone, 'Ruth Page' selected from the progeny of the cross, *Zephyranthes rosea* ♀ and *Z. citrina* ♂. A picture of this excellent clone was received too late for inclusion with the registration in the 1958 edition, and it is reproduced in the present issue (Fig. 16).

In the writer's garden at La Jolla, Calif., *Z. rosea* died out after a few years showing that the soil conditions, including the water applied, are lethal for it here. *Zephyranthes citrina* does quite well. The hybrid, as represented by the clone 'Ruth Page', however is a more vigorous, excellent garden plant here, increasing rapidly by offsets, like its seed parent, *Z. rosea,* and giving a showing of its beautiful pink blooms several times a year. This is a clear case of heterosis or hybrid vigor in which the particular combination of genes has given a plant which can withstand the soil conditions here that are lethal for one of its parents. If this should happen in nature, it would explain how two species by hybridization could produce a new species which might extend the range of a genus. The clone has been given an Award of Merit by the American Amaryllis Society, August 2, 1958.

Since this hybrid, as represented by the clone 'Ruth Page' will be widely grown due to its fine qualities, it is being named, *Z.* x *ruthiae,* in honor of Mrs. Ruth Page.

Zephyranthes × ruthiae Traub, **hybr. nov.**

Planta hybrida inter Z. critinam ♀ et Z. roseam ♂ parentibus intermermediis, floribus roseis.

HOLOTYPE: Traub No. 630 (TRA), cult. La Jolla, Calif., by H. P. Traub, clone 'Ruth Page'.

THE USE OF GLYCEROL IN HERBARIUM PRACTICE

Glycerol (trihydroxypropane, $C_3H_8O_3$), sometimes called glycerin, has a very great many uses. Leffingwell & Lesser (1945) list no less than 1583 uses. Carolina Biological Supply Co. (1957) recommend it for use in the drying of herbarium specimens. They point out that it is safe for use in this connection except that it must not be placed in contact with strong oxidizing agents such as potassium trioxide, potassium chlorate or potassium permanganate because this may produce an explosion. It absorbs moisture from the air, and is used therefore as a humectant. It is miscible in water, and because of its capacity for absorbing moisture it may be used as a drying agent.

LITERATURE REFERENCES

Carolina Biol. Supply Co., Herbarium Problems. Carolina Tips 20: 40. 1957.
Leffingwell, G, and K. Lesser. Glycerin. Brooklyn, N. Y. 1945.

CANCER INHIBITING SUBSTANCES FROM AMARYLLIDS

According to Dr. D. B. Fitzgerald of the National Cancer Institute, Bethesda, Maryland, a number of substances have been isolated from genera of the Amaryllis Family which possess the ability to inhibit the growth of cancer cells. It is interesting to note in this connection, that early herbalists maintained that *Narcissus* possesses value in the treatment of tumors. (See Fitzgerald et al, Jour. Nat'l Cancer Inst. *20:* 763-774. 1958.)

DIPLOID HEMEROCALLIS HYBRID—'Junipero Serra'

Plant 32″ tall; flower spicely fragrant; a blend, setsegs maize yellow, HCC-607, petsegs cadmium orange HCC-8 to 8/1; very faint reddish eye zone; petsegs creped, margins ruffled; sunfast and rainfast; heavy flower substance. Recurrent blooming. —*Hamilton P. Traub*

TETRAPLOID DAYLILY—'REV. TRAUB'

The plant of this clone is up to 25″ tall; up to 12 flowers per scape; evergreen; recurrent blooming. Flowers are up to 7″ wide, thick substance, wide open, brilliant silky cadmium orange self (HCC 8), 38 vivid orange DCN; fragrant.—*Hamilton P. Traub*

HYBRIDS IN THE TRIBE ZEPHYRANTHEAE

Hamilton P. Traub, *California*

Under date of Oct. 18, 1958, Dr. P. Maheshwari, of the University of Delhi, India, writes that "Two of my students have worked on the embryology of what appears to be *Cooperia pedunculata.* Since their findings and those of Dr. Coe (1953) on *Cooperia pedunculata* are quite different, it is possible that there is some error in identification. I am sending you bulbs and herbarium specimens of the plant and shall be grateful if you could identify."

When the herbarium specimens and bulbs arrived on Dec. 20, 1958, it was possible to compare the specimens (given Traub Herbarium No. 632) with those of *Zephyranthes drummondii* D. Don (syn.—*Z. pedunculata* Herb.) which showed that No. 632 is definitely not *Zephyranthes pedunculata* Herb. (=*Z. drummondii* D. Don), but belongs to *Zephyranthes* x *lancasteri* Traub (syn.—X *Cooperanthes rosea* Percy-Lancaster), one of the hybrids made by Mr. Sydney Percy-Lancaster at Alipore near Calcutta, India, in the early years of the present century.

This concrete case showed the necessity of putting the nomenclature (including typification) of such hybrids on a firm basis so that research in embroyology and other disciplines involving material of this kind may be given the desired scientific precision in order to avoid misapplication of the results.

It should also be noted in this connection that hybrids of this nature are being grown more and more as garden plants thus making it necessary to apply the correct names to avoid confusion.

The first hybrid of this kind, *Zephyranthes* x *spofforthiana* Herb. (in Bot. Reg. Lond. pl. 1746.; Baker Amaryll. 32. 1888) was reported by Herbert. *Zephyranthes* x *ajax,* a cross between *Z.* candida and *Z. citrina,* was reported in Gartenflora, plate 1469. 1899. This was followed by the report of Lancaster (1912-1913) including *Zephyranthes* crosses and also *Zephyranthes-Habranthus* crosses. One *Habranthus* hybrid has been recorded (Traub, 1951). Recently Howard (1959) reported on a *Zephyranthes* cross, and Traub (1958) described *Zephyranthes-Habranthus, Rhodophiala,* and *Habranthus-Rhodophiala* crosses.

PARENT STOCK USED BY PERCY-LANCASTER

In the early part of the present century, the *Amaryllidaceae* were relatively neglected by taxonomists, and the nomenclature was sometimes in a deplorable state. Thus it is necessary to examine the statements about the stock that Lancaster (1912-1913) used in his crosses. In the following presentation, the correct nomenclature is first given. This is followed in each case by the original description as reported by Percy-Lancaster, and the interpretation of this by the present writer.

1. Zephyranthes drummondii D. Don (in Sweet, Brit. Fl. Gard. Ser. II. pl. 328, Mr. 1. 1836); syn.—*Cooperia pedunculata* Herb. (in Amaryll. 179, pl. 42, fig. 3. 1837).

Lancaster's description.—"*Cooperia drummondii* [=*Zephyranthes drummondii* D. Don] has primrose-scented flowers, perfectly upright in growth, white in color, which open in the afternoon; the foliage is ¼ inch to ½ inch wide [6—13 cm. wide], covered with a whitish bloom. The anthers are pressed close around the style below the stigma, which is large, the perianth tube is 3 inches [7.6 cm.] long."

NOTES.—The relatively wide leaves with a whitish bloom indicate that this is apparently *Z. drummondii* D. Don (syn.—Cooperia pedunculata Herb.) as indicated above, and not *Cooperia drummondii* Herb. (=*Z. brazosensis* Traub).

2. ZEPHYRANTHES BRAZOSENSIS Traub (in Plant Life 7: 42. 1951), syn.—*Cooperia drummondii* Herb. (in Bot. Reg. Lond. pl. 1835. 1836); *Cooperia oberwetteri* Lancaster, in Jour. Roy. Hort. Soc. 38: 532. 1912-1913 (err. *C. oberwetti).*

LANCASTER DESCRIPTION.—Following the description quoted under No. 1, above, he states: "In *C. oberwetti* [*Zephyranthes brazosensis*] the foliage is narrower than *C. drummondii* [*Zephyranthes drummondii* D. Don], and has less bloom."

NOTES.—Since the leaves of *Zephyranthes brazosensis* (syn.—*Cooperia drummondii* Herb.) has narrower leaves with less bloom, this apparently belongs to that species. The name *Cooperia oberwetteri* (err. *oberwetti)* proposed by Lancaster is thus superfluous and a synonym of *Zephyranthes brazosensis.*

3. ZEPHYRANTHES GRANDIFLORA Lindl. This is indicated as the synonym "*Z. carinata*" which is to be attributed to "Spreng."

4. ZEPHYRANTHES CITRINA Baker. This is indicated as "*Z. citrina.*"

5. ZEPHYRANTHES TREATIAE S. Wats. This is indicated as "*Z. treatiae.*"

6. HABRANTHUS ROBUSTUS Herb. (syn.—*Zephyranthes robusta* (Herb.) Baker). This is indicated as "*Z. robusta.*"

7. HABRANTHUS ANDERSONII Herb. ex Lindl. (syn.—*Zephyranthes andersonii* (Herb.) Baker). This is indicated as "*Z. andersonii.*"

NOTES.—If Lancaster obtained his stock from Texas, then this apparently would be *Habranthus andersonii* var. texanus Herb., or *H. texanus* (Herb.) Steud., depending on the viewpoint of the particular taxonomic worker.

PERCY-LANCASTER HYBRID ZEPHYRANTHES

Lancaster included all of his hybrids under the name, X *Cooperanthes,* under the assumption that they were all crosses between *Zephyranthes* and *Cooperia.* But we now know that some of his crosses involved *Habranthus robustus* and *H. andersonii.* Since *Zephyranthes* and *Cooperia* grade into one another in nature, and they cross with fertile offspring, *Cooperia* has been united with *Zephyranthes* (Jones, 1957). Thus the *Zephyranthes* hybrids have to be separated from the *Zephyranthes-Habranthus* hybrids, and in this process, the name X *Cooperanthes,* derived from parts of the two generic names, "Cooper + anthes", becomes a synonym of the genus *Zephyranthes.*

The *Zephryanthes* hybrids will be included here; the *Zephyranthes-Habranthus* hybrids will be included in a separate section below.

8. ZEPHYRANTHES X LANCASTERI Traub, in Plant Life 10: 46. 1954; syn.—X *Cooperanthes rosea* Lancaster, in Jour. Roy. Hort. Soc. 38: 531. 1912-1913.

LANCASTER'S DESCRIPTION.—"*Cooperia drummondii* [=*Zephyranthes drummondii* D. Don] ♀ x *Zephyranthes carinata* [=*Z. grandiflora)* ♂]. "A strong-growing plant; flower scape 12 inches (30.1 cm.) high; flower larger than *Z. robusta* [=*Habranthus robustus*] pale-green centre, pale pinky-purple above, going off into deeper colour at the edges [lectotypus]".

9. ZEPHYRANTHES X BLANDA (Lancaster) Traub, in Plant Life 10: 46-47. 1954. Syn.—X *Cooperanthes blanda* Lancaster, in Jour. Roy. Hort. Soc. 38: 531. 1912-1913.

LANCASTER'S DESCRIPTION.—"*Cooperia oberwetti* [=*Zephyranthes brazosensis* Traub] ♀ x *Zephyranthes treatiae* ♂—A small flower, white, flushed pinky-purple, base apple-green; flower-stalk green, reddish base. The flower closes early the first day, but opens a second day; seed capsule like *Cooperia* [subgenus *Cooperia*]." (Lectotypus).

10. ZEPHYRANTHES X PERCYI Traub, in Plant Life 10: 47. 1954. Syn.—X *Cooperanthes* clone 'Percy' (Lancaster), in Jour. Roy. Hort. Soc. 38: 532. 1912-1913; X *Cooperanthes* clone 'Sydney', l. c. (reverse cross).

LANCASTER'S DESCRIPTION.—(*Zephyranthes citrina* ♀ x *Cooperia drummondii* [*Zephyranthes drummondii* D. Don] ♂).—Foliage like [subgenus] *Cooperia*, ⅛ inch [1.3 cm.] wide, with a faint tinge of bloom; flower-stalk 8 inches [20 cm.], base pale red; perianth tube short, pale green; ovary green; pistil suppressed; colour of flower pale cream, centre slightly deeper; flower nodding like *Zephyranthes*." (Lectotypus).

NOTES.—Reverse cross: clone 'Sydney'; "In foliage like *Cooperia drummondii* [=Zephyranthes drummondii D. Don], covered with a heavy bloom, ¼ inch [1.9 cm.] wide; flower-stalk 8 inches [20 cm.], green, base reddish; flower like *C. drummondii* [=Zephyranthes drummondii D. Don], pale sulphur in colour, fading to a creamy-white in the sun, but keeping open for a second day; flower upright like [subgenus] *Cooperia;* perianth tube 3½ inches [8.9 cm.] long." (clone 'Sydney', lectotypus).

OTHER HYBRID ZEPHYRANTHES

11. ZEPHYRANTHES X SPOFFORTHIANA Herb. (in Bot. Reg. Lond. 1746.; Baker, Amaryll. 32. 1888).—*Zephyranthes puertoricensis* x *Z. grandiflora.*

12. ZEPHYRANTHES X AJAX (in Gartenflora, plate 1469. 1899).—*Z. candida* x *Z. citrina.*

13. ZEPHYRANTHES X RUTHIAE Traub, in Plant Life 15: 36. 1958; Howard, in Plant Life 15: 85-86. 1959.—*Z. rosea* x *Z. citrina.*

13a. *Zephyranthes drummondii* D. Don ♀ x *Z. pulchella* J. G. Smith ♂. Cross made by Fred B. Smith; Plant Life 13: 86-87. 1957.

HABRANTHUS HYBRID

One cross within the genus *Habranthus* has been reported.

14. Habranthus x floryi Traub, in Plant Life 7: 121-122, fig. 23. 1951.—*Habranthus brachyandrus* ♀ x *H. robustus* ♂.

BI-GENERIC HYBRIDS, X SYDNEYA

The *Zephyranthes-Habranthus* crosses formerly included in X *Cooperanthes* belong under X *Sydneya* Traub (in Plant Life 10: 47. 1954). The Lancaster hybrids and one additional hybrid are listed below.

15. X Sydneya lancastrae (Lancaster) Traub, in Plant Life 10: 47. 1954; syn.—X *Cooperanthes lancastrae* Lancaster, in Jour. Roy. Hort. Soc. 38: 531. 1912-1913; clone 'Alipore Beauty' (Lancaster), l. c. 532.

Lancaster description.—"*(Cooperia oberwetti* [=*Zephyranthes brazosensis*] ♀ x *Zephyranthes robusta* [=*Habranthus robustus*] ♂).—similar to the above [=No. 8, above in the present article] but much more robust, with stout flower-stalks; ovary brownish-green, centre of flower apple-green, yellowish-white above, going off into pinkish lilac; flower larger than above [=No. 8, above in the present article]". (Lectotypus).

Notes.—Description of clone 'Alipore Beauty' (Lancaster):—"In foliage like *Zephyranthes robusta* [=*Habranthus robustus*], ¼ inch [6 mm.] wide, with a faint tinge of bloom; flower-stalk 8 inches [30 cm.], base pale red; perianth tube short, pale green; ovary green; pistil suppressed; colour of flower pale cream, centre slightly deeper; flower nodding like *Zephyranthes.*" [clone 'Alipore Beauty' (Lancaster), lecto typus].

16. X Sydneya bella (Lancaster) Traub, *comb. nov.* Syn.—X Cooperanthes *bella* Lancaster, in Jour. Roy. Hort. Soc. 38: 531. 1912-1913; clone 'Mary' (Lancaster), 1. c. 532.

Lancaster description.—"*(Cooperia drummondii* [=*Zephyranthes drummondii* D. Don] ♀ x *Zephyranthes robusta* [=*Habranthus robustus*] ♂).—A strong grower; flower-stalk like *Z. robusta* [=*Habranthus robustus*] on emerging above ground, dull green; flower-bud white, tipped pink at apex and edges of petals; colour soft rose, outside of petals deeper pink. The flower opens late in afternoon and is faintly scented like [subgenus] *Cooperia.*" (Lectotypus).

Notes.—Description of clone 'Mary' (Lancaster):—"In foliage like *Cooperia drummondii* [=*Zephyranthes drummondii* D. Don], covered with a heavy bloom, ¼ inch [6 mm.] wide; flower-stalk 8 inches [20 cm.] high, base brownish-green; the flower is the size of *Cooperia drummondii* [=*Zephyranthes drummondii* D. Don], only a delicate flesh-pink; perianth tube 2½ inches [6.4 cm.] long; pistil suppressed; flower upright like [subgenus] *Cooperia.*" [clone 'Mary' (Lancaster), lectotypus].

17. X Sydneya india Traub, in Plant Life 10: 47. 1954. Syn.—X *Cooperanthes* clone 'Sunset' (Lancaster), in Jour. Roy. Hort. Soc. 38: 531. 1912-1913.

LANCASTER DESCRIPTION.—"*Cooperia drummondii* [*Zephyranthes drummondii* D. Don] ♀ x *Zephyranthes andersonii* [=*Habranthus andersonii* ♂].—This flower is a small-sized [member of subgenus] *Cooperia;* inside copper and yellow; habit of [subgenus] *Cooperia.*" (Lectotypus).

18. X SYDNEYA CASTELLANOSII Traub, in Plant Life 14: 50. 1958.—*Zephyranthes grandiflora* ♀ x *Habranthus juncifolius* ♂.

RHODOPHIALA HYBRID

One cross within the genus *Rhodophiala* has been reported.

19. RHODOPHIALA X LAJOLLA Traub, in Plant Life 14: 47-48. 1958.—*Rhodophiala bifida* ♀ x *R. chilensis* ♂.

BI-GENERIC HYBRID, X RHODOBRANTHUS

One hybrid of this nature has been reported.

20. X RHODOBRANTHUS WOELFLEANUS Traub, in Plant Life 14: 48-49. 1958.—*Rhodophiala bifida* ♀ x *Habranthus juncifolius* ♂.

CONCLUSIONS

The published results show that *Cooperia* crosses with *Zephyranthes,* the latter crosses with *Habranthus* which in turn crosses with *Rhodophiala.* Thus the facts prove conclusively that the genera *Zephyranthes* (including *Cooperia), Habranthus* and *Rhodophiala* belong together in the tribe *Zephyrantheae.*

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Traub, Hamilton P. *Habranthus* x *floryi* Plant Life 7: 121-22, fig. 23. 1951.

————. Percy-Lancaster Hybrids. Plant Life 10: 46-47. 1954.

————. Crosses involving *Rhodophiala, Habranthus* and *Zephyranthes.* Plant Life 14: 47-51. 1958.

————. *Zephyranthes* x *ruthiae.* Plant Life 15: 35-36. 1959.

REGISTRATION OF NEW AMARYLLID CLONES

Registrar: Mr. W. D. Morton, Jr.

This department has been included since 1934 to provide a place for the registration of names of cultivated *Amaryllis* and other amaryllids. The procedure is in harmony with the INTERNATIONAL CODE OF BOTANICAL NOMENCLATURE (edition publ. 1956) and the INTERNATIONAL CODE OF NOMENCLATURE FOR CULTIVATED PLANTS (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, "DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893-1948" by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $2.50 prepaid from: Dr. Thos. W. Whitaker, Executive Secy, The American Plant Life Society, Box 150, La Jolla, Calif. A catalog of Amaryllis names, and also a catalog of the names of other cultivated amaryllids, is scheduled for publication in 1960 Herbertia.

Only registered clones of Amaryllis and other amaryllids are eligible for awards and honors of the American Amaryllis Society. Numbers of registered clones are preceded by a prefix, an abbreviation for the genus concerned. Thus, A-390, the "A" standing for *Amaryllis;* Z-1, the "Z" standing for *Zephyranthes,* etc.

Correspondence regarding registration of all amaryllids such as *Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,* and so on, should be addressed to: Mr. W. D. Morton, Jr., Registrar, 3114 State Street Drive, New Orleans 25, Louisiana. The registration fee is $2.00 for each clone to be registered. Make checks payable to American Plant Life Society.

HYBRID AMARYLLIS CLONES

Introduced by Ludwig & Co., Hillegom, Netherlands:

'American Express' (Ludwig), Reg. No. A-421, 8-1-58. D-5a; scape 26-28″; fl. 8″ diam.; oriental red (somewhat lighter than HCC-819), darker throat with violet-red reflection, lighter red stamens; 4 fls. per scape. Spring.

'Apple Blossom' (Ludwig), Reg. No. A-422, 8-1-58. D-5b; scape 22″; fl. 8″ diam.; white with dawn pink (HCC-523), lower segs are lighter shade, stamens white, throat faintly greenish with dark red ring; 4—5 fls. per scape. Deciduous. Spring.

'Attraction' (Ludwig), syn.-'Red Radiance', PL. 14: 55. 1958, red. No. A-457, 8-1-58. D-5b; scape 28-30″; fl. 7½″ diam.; capsicum red (HCC-715), darker in throat; 4 fls per scape. Deciduous. Spring.

'Blazing Star' (Ludwig), Reg. No. A-463, 9-15-58; D-5a; scape 22″; fl. 9½″ diam.; dark vermilion red (slightly darker than Dutch vermilion HCC-717), darker throat; 4 fls per scape. Deciduous. Spring.

'Bouquet' (Ludwig), reg. No. A-424, 8-1-58; scape 25-28″; D-5a; fl. 8½-9″ diam.; general effect is a fine salmon, begonia rose (HCC-619 to 619/2) with throat and stamens deeper empire rose (HCC-0621); 4 fls per scape. Deciduous. Spring.

'Bridesmaid' (Ludwig), reg. No. A423, 8-1-58, scape 22-24″; D-5b; fl. 7½″ diam.; pure white with light greenish tinge in throat. 3—4 fls per scape. Deciduous. Spring.

'Brilliant' (Ludwig), reg. no. A-425, 8-1-58; scape 23-24″; D-5a; fl. 8½″ diam.; vivid signal red (darker than HCC-719) with glossy dark red throat; 4 fls per scape. Deciduous. Spring.

'Candy Cane' (Ludwig), reg. no. A-426, 8-1-58; scape 26-28″; D-5a; fl. 8—9″ diam.; segs are white-edged, with a white band in center, and bright capsicum red (HCC-715/3) bands between the white; stamens white. Deciduous. Spring.

'Champion's Reward' (Ludwig), reg. no. A-427, 8-1-58; scape 26-28″; D-5a, fl. 9″ diam.; vivid oriental red (HCC-819) with deep glossy throat; rounded flower, segs recurvate, back of segs colored; 4 fls per scape. Deciduous. Spring.

'Cardinal' (Ludwig), reg. no. A-464, 9-15-58; scape 22-24″; D-5a; fls 8″ diam.; dark oxblood red (HCC-820) with very dark currant red throat; 4 fls per scape. Spring.

'Daintiness' (Ludwig), reg. no. A-428, 8-1-58; scape 24″; D-5b; fls 8″ diam.; very fine porcelain rose (HCC-620) with crimson rose (22/2) towards center of segs, throat veined soft green, stamens porcelain rose; deciduous, spring.

'Delilah' (Ludwig), reg. no. A-429, 8-1-58; scape 25″; D-5a; fls. 8″ diam.; fine begonia pink (salmon) (HCC-619) with darker shading into throat; rounded blooms; 4 fls per scape. Deciduous. Spring.

'Diamond' (Ludwig), reg. no. A-430, 8-1-58; scape 25″; D-5a; fls 8½″ to 9″ diam.; fine geranium red (HCC-20) with dark purple red throat, inner segs slightly fringed and bearded; 4 fls per scape. Deciduous. Spring.

'Doris Lilian' (Ludwig), reg. no. A-431, 8-1-58; scape 26-28″; D-5b; fls 7½″ diam.; carmine rose (HCC-21), lower segs and tips somewhat lighter (21/1), throat dark glossy carmine red; 4 fls per scape. Deciduous. Spring.

'Fantasy' (Ludwig), reg. no. A-432, 8-1-58; scape 25″; D-5a; fls 7½″ diam.; delft rose (HCC-020) with faint rose stripe on segs, tips almost white to very light rose; stripes change to apple green toward center, and deeper rose in throat, with faint red ring; stamens white; 4 fls per scape. Deciduous. Spring.

'Fire Dance' (Ludwig), reg. no. A-465, 9-15-58; scape 24″; D-5a; fls 9½ to 10″ diam.; Dutch vermilion (Approx. HCC-717), with dark violet red throat; very flat; 4 fls per scape. Deciduous. Spring.

'Fire Fly' (Ludwig), reg. no. A-469; 1958; scape 16″; D-gracilis type; fls. 4″ diam.; clear capsicum red (HCC-715) with darker throat; 4-6 fls per scape. Deciduous. Spring.

'Five Star General' (Ludwig), reg. no. A-434, 8-1-58; scape 28-30″; D-5a; fls 9-10″ diam.; signal red (HCC-719), white star center, dark red ring in throat; 4 fls per scape; deciduous, spring.

'Franklin Roosevelt' (Ludwig), reg. no. A-433, 8-1-58; scape 25″; D-5b; fls 7½″ diam.; currant red (HCC-821), upper segs somewhat deeper red than lower, faint stripe in center of segs, very dark red in throat; stamens blood red; 4 fls to scape. Deciduous. Spring.

'Halley' (Ludwig), reg. no. A-435, 8-1-58; scape 25″; D-5b; fls lively poppy red (HCC-16), which is an orange red, with very dark throat, and dark stamens, segs veined a darker shade; fls flat; 4 fls per scape. Deciduous. Spring.

'Helen' (Ludwig), reg. no. A-436, 8-1-58; scape 26-28″; D-5b; fls 8″ diam.; begonia pink (HCC-619 to 619/1), light carmine-rosy stripe in center of segs, and veined dark red; white ring in throat; stamens rosy red; 4—5 fls per scape. Deciduous. Spring.

'Invincible' (Ludwig), reg. no. A-437, 8-1-58; scape 24-28″; D-5a; fls 8″ diam.; fine capsicum red (HCC-715) with dark red throat; 4 fls per scape. Spring.

'Liberty Hyde Bailey' (Ludwig), reg. no. A-466, 9-15-58; scape 24-26″ diam.; D-5a; clear oriental red (almost HCC-819), self; 4 fls per scape. Deciduous. Spring.

'Little Sweetheart' (Ludwig), reg. no. A-470, 1958; D-gracilis type; fls 4″ diam.; salmon-red with soft greenish-white star-like throat outlined with darker red streaks; 4—5 fls per scape. Deciduous. Spring.

'Love's Desire' (Ludwig), reg. no. A-438, 8-1-58; scape 24-26″; D-5a; fls 8½-9″ diam.; coral pink (HCC-0619) and porcelain rose (620), with reddish stripes in center of segs, throat light greenish-white; 4 fls per scape. Deciduous. Spring.

'Lucky Strike' (Ludwig), reg. no. A-443, 8-1-58; scape 24″; D-5a; oriental red (HCC-819) with dark ox-blood red throat; 3—4 fls per scape deciduous; deciduous, spring.

'Ludwig's Dazzler' (Ludwig), red. no. A-439, 8-1-58; scape 26″; D-5a; fls 8½″ diam.; pure white with nearly white throat; 4 fls per scape; deciduous; spring.

'Ludwig's Goliath' (Ludwig), reg. no. A-442, 8-1-58; scape 24-25″; dark orient red (HCC-819), and deeper throat; 4 fls per scape; deciduous; spring.

'Ludwig's It' (Ludwig), reg. no. A-467, 9-15-58; scape 26-30″; D-5a; fls 10″ diam.; dark blood red (darker than HCC-820), currant red (821) throat, fls flat; deciduous; spring.

'Ludwig's Masterpiece' (Ludwig), reg. no. A-440, 8-1-58; scape 28-30″; D-5a; fls 8″ diam.; dark Dutch vermilion (darker than HCC-717), deeper throat; 4-5 fls per scape; deciduous, spring.

'Ludwig Scarlet' (Ludwig), reg. no. A-441, 8-1-58; scape 25″; D-5a; fls 7½″ diam.; dark blood red (HCC-820) darker in throat, inner segs slightly bearded; 4 fls per scape; deciduous; spring.

'Margaret Rose' (Ludwig), reg. no. A-444, 8-1-58; scape 26-28″; D-5a; shrimp red (HCC-616/3) striped, halo of mandarin red (17/1) on upper segs, begonia rose on lower; throat light mandarin red; stamens soft rose; fls flat; 4 fls per scape; deciduous; spring.

'Maria Goretti' (Ludwig), reg. no. A-445, 8-1-58; scape 24″; D-5b; fls 8-9″ diam.; pure white, with apple green throat; 4 fls per scape; deciduous; spring.

'Miss Margaret Truman' (Ludwig), reg. no. A-446, 8-1-58; scape 26-28″; D-5a; fls 8″ diam.; porcelain rose (HCC-620) with camellia rose (622) reflection; throat dark rose; 4 fls per scape; deciduous, spring.

'Mothersday' (Ludwig), reg. no. A-447, 8-1-58; scape 28-30″; D-5a; fls 8½ to 9″ diam.; mandarin red (HCC-17) with violet reflection toward center; throat dark red; 3-4 fls per scape; deciduous; spring.

'Nivalis' (Ludwig), reg. no. 448, 8-1-58; scape 22-24″; D-5b; pure white with faint greenish throat; 3—4 fls per scape; deciduous; spring. Award of Merit, American Amaryllis Society, 1952.

'Peacefulness' (Ludwig), reg. no. A-449, 8-1-58; scape 28-30″; D-5a; fls 8″ diam.; blood red (HCC-830), carmine glow and dark red throat; 3—4 fls per scape; deciduous; spring.

'Picture' (Ludwig), reg. no. 471, 1958; scape 16-18″; D-gracilis type; fls 4″ diam.; orient red (HCC-819) with white star, and light red throat; 4 fls per scape; deciduous, spring.

'Pink Favorite' (Ludwig), reg. no. 450, 8-1-58; scape 28-30″; D-5b; fls 9″ diam.; camellia rose (HCC-622), tips of segs lighter rose (622/2), darker throat; 3-4 fls per scape; deciduous; spring.

'Pink Perfection' (Ludwig), reg. no. A-451, 8-1-58; scape 24-28″; D-5a; fls 8″ diam.; opal rose (HCC-022), seg tips lighter carmine rose (021/2); 4 fls per scape; deciduous; spring.

'Pinksterflower' (Ludwig), reg. no. A-452, 8-1-58; scape 25-27″; D-5a; fls 8″ diam.; azalea pink (HCC-618) with poppy red reflection, throat camellia rose; 4-5 fls per scape; deciduous; spring.

'Rossini' (Ludwig), reg. no. A-454, 8-1-58; scape 24-26″; D-5a; fls 7½″ diam.; carmine rose (HCC-21) with neyron rose (023) seg tips, darker carmine rose in throat; 2—3 fls per scape; deciduous; spring.

'Salmon Joy' (Ludwig), reg. no. 445, 8-1-58; scape 28-30″; D-5a; fls 8½″ diam.; soft mandarin red (HCC-17/1) which is salmon-orange; throat dark red; 3—4 fls per scape; deciduous; spring.

'Shakespeare' (Ludwig), reg. no. A456, 8-1-58; scape 25-27″; D-5a; fls 8″ diam.; glowing dark orient red (HCC-819), dark red throat; stamens light vermilion red; 4 fls per scape; deciduous; spring.

'Silver Lining' (Ludwig), reg. no. A-458, 8-1-58; scape 28″; D-5a; fls 9-10″ diam.; red and white striped, segs white-edged, white star in center, dark red ring in throat; 4-5 fls per scape; deciduous; spring.

'Siren' (Ludwig), reg. no. A-459, 8-1-58; scape 27″; D-5a; fls 8-9″ diam.; beautiful salmon rose, violet-shaded, with a lighter streak in the center of the segs; 4 fls per scape; deciduous; spring.

'Traffic Stop' (Ludwig), reg. no. 468, 9-15-58; scape 24-26″; D-5a; fls 8½″ diam.; clear capsicum red (HCC-715) with slightly darker throat; 4 fls per scape; deciduous, spring.

'White Giant' (Ludwig), reg. no. 460, 8-1-58; scape 22-24"; D-5a; fls 9″ diam.; pure glistening white of heavy substance; light greenish throat; 3—4 fls per scape; deciduous; spring.

'Winter Joy' (Ludwig), reg. no. A-461, 8-1-58; scape 23″; fls 8-9″ diam.; vermilion red, with dark red throat; 4 fls per scape; deciduous; free-flowering; spring.

'Wyndham Hayward' (Ludwig), reg. no. A-462, 8-1-58; scape 28-30″; D-5a; fls 8½-9″ diam.; dark oriental red (HCC-819), with dark blood red throat, contrasting with the lighter red stamens; 4 fls per scape; deciduous; spring.

Introduced by W. S. Warmenhoven, Hillegom (P. J. Komen, Anna Paulowna) Holland:

'Anna Paulowna' (Warmenhoven), reg. No. A-492. Glistening light salmon red with deep red throat; scape 26″; 8″ across face.

'Beacon' (Warmenhoven), reg. No. A-493; introduced 1954. Deep frosty salmon with clear well defined ¾″ band of glistening white down center of each tepalseg; scape 26″; 10″ cross face.

'Beau Joliat' (Warmenhoven), reg. no. A-494. Rosy red; scape 22″, 3½″ across face.

'Bordeaux' (Warmenhoven), reg. no. 495. Clear light orange-scarlet blending to deep scarlet in throat; scape 28″; 10″ across face.

'Cherokee' (Warmenhoven, 1954), reg. no. A-496. Clear sparkling metallic red with orange cast; scape 26″; 8″ across face.

'Christmas Joy' (Warmenhoven), reg. no. A-497. Red; scape 24″; 3½″ across face.

'Flower Record' (Warmenhoven), reg. no. A-516. Deep scarlet; scape 23″; 3″ across face.

'Joan of Arc' (Warmenhoven), reg. no. A-498. Pure glistening white with green in throat; scape 24″; 7½″ across face.

'King of Stripes' (Warmenhoven), reg. no. A-499. Frosty pale pink to white with two broad undefined lines of carmine (shading to vermilion in throat) on each tepalseg; scape 24″; 5″ across face.

'Leading Lady' (Warmenhoven), reg. no. A-500. Wide open pure white with green throat; scape 20″; 7″ across face.

'Lucifer' (Warmenhoven), reg. no. A-501. Medium dark red of great substance; scape 19″; 8″ across face.

'Moreno' (Warmenhoven), reg. no. A-502. Medium dark red with slight tinge of rose in throat; scape 26″; 8″ across face.

'Mount Tacoma' (Warmenhoven), reg. no. A-503. Pure white with faint green tinge in throat; scape 24″; 7″ across face.

'Mysterie' (Warmenhoven), reg. no. A-504. Rose red blending to deep red in throat, midribs and tips of tepalsegs are rose; scape 20″; 7″ across face.

'Orange King' (Warmenhoven), reg. no. A-505. Light red; scape 18″; 8″ across face.

'Prince of Orange' (Warmenhoven), reg. no. A-506. Orange, blending to scarlet deep in throat; scape 19″; 8″ across face.

'Queen of Whites' (Warmenhoven), reg. no. A-507. Glistening waxy-white with faint tint of green in throat; scape 25″; 9″ across face; blooms flat with slight curve at tips.

'Queen's Page' (Warmenhoven), reg. no. A-508. Clear salmon orange; scape 20″; 8″ across face.

'Salmonette' (Warmenhoven), reg. no. A-509. Clear salmon with deeper salmon throat; scape 24″; 8″ across face.

'Scarlet Beauty' (Warmenhoven), reg. no. A-510. Scarlet blending to medium red; dark red in throat; possesses glistening velvety sheen; scape 24½″; 9″ across face.

'Scarlet Triumph' (Warmenhoven), reg. no. A-511. Clear scarlet, approaching nearly to light red, leathery substance; scape 24″; 10″ across face.

'Star of Bethlehem' (Warmenhoven), reg. no. A-512. Salmon pink with white toward margins, forming a star; scape 24″; 3½″ across face.

'Striped Beauty' (Warmenhoven), reg. no. A-513. White with orange-scarlet bands that cover large part of tepalseg giving the appearance of a white border; scape 20″; 6″ across face.

'Sweet Seventeen' (Warmenhoven), reg. no. A-514. Frosty salmon rose on white, flesh pink in throat; scape 20″; 9″ across face.

'Violetta' (Warmenhoven), reg. no. A-515. Medium to deep rose with a light rose throat, and light rose midribs; scape 22″; 8″ across face.

Introduced by M. Van Waveren & Sons, Leeuwenstein Nurseries, Hillegom, Holland:

'Clown' (Van Waveren), reg. no. A-406. Basic color white, with white stripe down center of tepalsegs, remaining part of tepalsegs marked with vivid red veins; scape 22-26″; 8-9″ across face.

'Fulda' (Van Waveren), reg. no. A-407. Orange-scarlet; 3—4 blooms to 26-28″ scapes; 9—10″ across face.

'House of Orange' (Van Waveren), reg. no. A-408. Rare attractive flaming orange; scapes 26-28″ tall; 3—5 flowers per scape; 8″ across face.

'Kathleen Ferrier' (Van Waveren), reg. no. A-393. Pure white with creamy throat; scapes 26-28″ tall; flowers 8—10″ across face.

'Modern Times' (Van Waveren), reg. no. A-396. Deep blood red self; scapes 26-28″ tall; flowers 8—10″ across face.

'Morning Kiss' (Van Waveren), reg. no. A-409. Salmon pink; scapes 26-28″ tall; flowers wide-open, 8—10″ across face.

'Northern Queen' (Van Waveren), reg. no. A-410. Salmon-orange, slightly tinged carmine-red toward center of tepalsegs; outside pure salmon rose with white streak; scapes 26-28″ tall; flowers 8—10″ across face.

'Queen of Scarlets' (Van Waveren), reg. no. A-411. Brilliant scarlet; scape 24″ tall; 4—5 flowers per scape; flowers 8″ across face.

'Red Champion' (Van Waveren), reg. no. A-412. Deep brilliant red; scape 22″ tall; 4 flowers per scape; flowers 8—9″ across face.

'Red Guard' (Van Waveren), reg. no. A-413. Deep scarlet; scape 24″ tall; 4—5 flowers per scape; flowers 9″ across face.

'Red Lion (Van Waveren), reg. no. A-414. Dark red; scape 22″ tall; 4 flowers per scape; flowers 8″ across face.

'Rose Queen' (Van Waveren), reg. no. A-415. Old rose color slightly darker in throat; scape 24″ tall; 3-4 flowers per scape; flowers 8″ across face.

'Royal Velvet' (Van Waveren), reg. no. A-394. Warm deep red to purple; scapes 22-24″ tall; flowers 8″ across face.

'Salmon Beauty' (Van Waveren), reg. no. A-395. Salmon pink self; scapes 18-24″ tall; 4 flowers per scape; flowers 8″ across face.

'Salmon Giant' (Van Waveren), reg. no. A-416. Coppery salmon pink; scapes 26-28″ tall; regular-shaped flowers, 8—10″ across face.

'Salmonea' (Van Waveren), reg. no. A-417. Delicate light pink; scapes 22-24″ tall; 4 flowers per scape; flowers 8—9″ across face.

'Scarlet Leader' (Van Waveren), reg. no. A-418. Deep scarlet red with darker red spot deep in throat; trumpet-shaped; scapes 26-28″ tall; 4 flowers per scape; flowers 8—10″ across face.

'Scarlet Pimpernel' (Van Waveren), reg. no. A-419. Pure scarlet self; scape 26″ tall; 4 flowers per scape; flowers 8—9″ across face, rounded in shape.

'Senator Wallace' (Van Waveren), reg. no. A-420. Rose, shaded white; scapes 24″ tall; 4 flowers to scape; flowers 8″ across face.

'White Abundance' (Van Waveren), reg. no. A-397. Pure white, throat at first slightly greenish turning to pure white; scape 26″ tall; 4 flowers to scape; flowers 8″ across face.

Introduced by G. C. Van Meeuwen & Zonen, Heemstede, Holland:

'Albino' (Van Meeuwen, 1948), reg. no. A-517. Pure white; scape 22″ tall; flower length 5″; 7″ across face.

'Alcyone' (Van Meeuwen, 1952), reg. no. A-518. Deep dark red; scape 22″ tall; flower length 5″; 7″ across face.

'Camelia' (Van Meeuwen, 1953), reg. no. A-519. Salmon rose, partially double; scape 24″ tall; flower length 4″; 8″ across face.

'Cleopatra' (Van Meeuwen, 1953), reg. no. A-520. Pure salmon; scape 20″ tall; flower length 5″; 7″ across face.

'Fabiola' (Van Meeuwen, 1953), reg. no. A-521. Bright red; scape 24″ tall; flower length 5½″; 8″ across face.

'Faust' (Van Meeuwen, 1949), reg. no. A-522. Shiny Dutch vermilion; scape 32″ tall; flower length 5½″; 8″ across face.

'Friendship' (Van Meeuwen, 1956), reg. no. A-523. Salmon with a white glow; scape 28″ tall; flower length 5″; 7″ across face.

'Giant Goliath' (Van Meeuwen, 1953), reg. no. A-524. Deep vermilion; scape 28″ tall; flower length 6″; 9″ across face.

'Julia' (Van Meeuwen, 1950), reg. no. A-525. Orange red; scape 24″ tall; flower length 5″; 7½″ across face.

'King Gustav VI' (Van Meeuwen, 1956), reg. no. A-526. Bright red; scape 32″ tall; flower length 6″; 8″ across face; named in the presence of His Majesty, the King of Sweden.

'Purple Queen' (Van Meeuwen, 1949), reg. no. A-527. Dark red to purple; scape 22″ tall; flower length 5½″; 7″ across face.

'Queen of Sheba' (Van Meeuwen, 1958), reg. no. A-528. Pink with a camellia pink cast; darker in throat; scape 24″ tall; flower length 5½″; 7″ across face.

'Queen Superiora' (Van Meeuwen, 1948), reg. no. A-529. Dark red; scape 22″ tall; flower length 5½″; 7″ across face.

'Queen of the Pinks' (Van Meeuwen, 1957), reg. no. A-530. Soft camellia pink; scape 24″ tall; flower length 5½″; 7″ across face.

'Queen Rose' (Van Meeuwen, 1949), reg. no. A-531. Light red to rose white, star in center; scape 22″ tall; flower length 5″; 7″ across face.

'Tristan' (Van Meeuwen, 1955), reg. no. A-532. Dark purple red; scape 24″ tall; flower length 6″; 8″ across face.

'Valendam' (Van Meeuwen, 1956), reg. no. A-533. White edged rose pink; scape 22″ tall; 7″ across face.

"White Christmas' (Van Meeuwen, 1956), reg. no. A-534. Pure white even in throat; scape 24″ tall; flower length 5½″; 8″ across face.

'Zenith' (Van Meeuwen, 1956), reg. no. A-535. Three lower tepalsegs (setsegs) white; three upper tepalsegs (petsegs) deep dark rose changing to white in center; scape 24″ tall; flower 5½″; 8″ across face.

'Gracilis Boegschoten' (Van Meeuwen, 1946), reg. no. A-536. Red; scape 18″ tall; flower length 3″; 2-3″ across face.

Introduced by S. P. Gasperez, 1219 Short St., New Orleans, La.

Correction, Plant Life 1958, page 54, for 'Amita' read 'Anita'.

HYBRID BRUNSVIGIA CLONES

Registered by L. S. Hannibal, Fair Oaks, Calif.

Small offsets from several *Crinum* and *Brunsvigia* hybrids were received from G. K. Cowlishaw some ten years ago. These plants had been registered with the Royal Horticultural Society of New South Wales. Due to the slow growth of the bulbs and erratic flowering habits complete descriptions have been delayed until the fall of 1958.

The hybrid *Brunsvigia* clones are later generation hybrids obtained in Australia and elsewhere between the CAPE BELLADONNA, *Brunsvigia rosea* and *Brunsvigia grandiflora, B. josephinae* and possibly other *Brunsvigia* species.

Brunsvigia x multiflora clone 'Betty Cowlishaw'. This is a well formed *B. x multiflora alba* type of plant with radial umbel. The tepalsegs are well reflexed, and medium wide, lance tipped and slightly ruffled. Our Australian friends have never had much success with *B. x multiflora* 'Hathor' as a seed parent due to high summer humidities, and consequently have experienced many more difficulties in producing wide seged white multifloras than the breeders in California. As a consequence this hybrid represents top achievement for 1948 Australian standards, but has been surpassed since. B-1.

Brunsvigia x multiflora clone 'Sunset'. The umbel to this plant exhibits a dozen or more medium-small well reflexed flowers arranged in a radial pattern. The throats are a deep yellow on the interior and copper red on the exterior. The tepalsegs are a rich pink with a *B. x parkeri* type of bright pink eye near the tip of each tepalseg. This plant is typical of throwbacks to the original *Eubrunsvigia* parentage employed by J. C. Bidwell. Colors are not as vivid or as deep as L. S. Hannibal's 'Stormy Sunset' series but the floral shapes and pattern of the G. K. Cowlishaw plant show a close relationship to the latter. B-2.

HYBRID CRINUM CLONE

Registered by L. S. Hannibal, Fair Oaks, Calif.

Crinum clone 'George Harwood': An H. B. Bradley seedling which first flowered after Bradleys death. The plant appears to be a Powellii type of hybrid, being a cross of *C. moorei* on a red flowered form of C. bulbispermum. The foliage is typically *C. moorei* in type, being some four feet long. Scape erect, 40 inches in length. Flowers about 12, large, chalice shaped, a deep wine red not unlike the color of *C. x* 'Ellen Bosanquet'. C-1.

Typical of *C. moorei* the plant requires shade. Offsets form quite slowly and the plant does not flower until these are fully matured. G. K. Cowlishaw reports that it was only by chance that these bulbs were saved since the Sydney bridge now crosses the land where Bradley had his garden.

AMARYLLID GENERA AND SPECIES

Harold N. Moldenke

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time so that these will be available to the readers.]

Narcissus cantabricus var. *petunioides* A. Fernandes, Kew Bull. 381. 1958.—Bulb ovate, 2 cm. long, 1.3 cm. wide, surrounded by brownish tunics; leaves 3 or 4, semiterete, twisted, generally recurved, up to 30 cm. long, long-attenuate at the base, longer than the scape; scape cylindric, about 15 cm. long, twisted and therefore more or less curved; spathe sheath-like at the base, scarious, pale-brown, about 3 cm. long; flower oblique, the pedicel about 5 mm. long; perigonium white, bright-yellow in drying, about 3.3 cm. long, the segments 5—6 mm. wide at the base, subequaling the corona; corona about 12 mm. long, resembling the corolla of *Petunia,* crenate along the margin; stamens and style long-exserted.

It is related to var. *kesticus,* from which it differs in its 3 or 4 twisted and recurved (not 2 erect) leaves, its shortly pedicellate flowers which are white (not greenish-white), its broader segments, and especially in the Petunia-like corona.

Latace R. A. Phil., Anal. Univ. Chil. 93: 274. 1896.—Plants bulbous, scape-bearing; flowers umbellate, included by a diphyllous spathe; perigonium monophyllous hypogynous, divided about the middle into six reflexed lobes as in *Hyacinthus orientalis;* stamens arising from the throat, three sterile, cylindric, thickened, exactly as in *Leucocoryne,* the three others fertile, exserted, with filiform filaments and linear anthers dehiscing longitudinally; ovary subglobose; style elongate; stigma simple.—Close to Leucocoryne, differing in the short tube of the perigonium, the exserted stamens, and the elongate style. I have paid respects to the plant in the name.

Latace volkmannii R. A. Phil. l. c.—Bulb about the size of a hazelnut, that is, with a diameter of 13 mm., covered by bright-brown membranes, the interior ones showing clearly the veins of the aborted leaves which come to a point. There are 2 normal green leaves about 1.25 mm. wide. Their length cannot be determined because their end is frayed. The scape is 22 cm. in length and 1.75 mm. wide. The spathe is white, scarious, about 8 mm. long, ovate. The umbel is composed of 7 flowers, whose pedicels are very delicate and of unequal length, the longest being 18 mm. long. The perigonium, whose color is not known, is 8 mm. long; the diameter of the tube is 2.25 mm. The segments are lanceolate and 6 mm. long when fully extended. The fertile stamens are a little shorter than the segments, while the sterile ones are half as long. The style is 4 mm. long.—The plant was collected by the late Volkmann in the summer of 1861-1862 in the Cordillera of Doña Rosa, in the province of Coquimbo.

J. D. Hooker writes me that Mr. Baker, to whom he sent one of my sketches of a flower of *Latace*, thinks that it is only a species of *Nothoscordum* (in spite of the monophyllous perigonium!), which I believe few botanists will agree with except those who unite the genera *Leucocoryne* and *Nothoscordum* into one genus.

Leucocoryne montana R. A. Phil. l. c. 269.—Leaves linear, narrow, 3 mm. wide, obtuse; scape 4-flowered; peduncle elongate; perigonium 30 mm. long, narrowly tubular; segments of the limb white, narrow, 3 mm. wide, slightly surpassing the tube in length; sterile stamens yellow, narrow, half as long as the segments.—Found on the mountain Campana de Quillota by Augustus Borchers in the year 1884.—The scape measures at least 20 cm. in height, the spathe 28 mm., the peduncles eventually 55 mm. long; the diameter of the perigonium is 3 cm.—There are 2 described species with a much smaller number of flowers than are found in the umbel of *L. alliacea* (Gay VI, p. 123).

Leucocoryne narcissoides R. A. Phil. l. c. 271.—Scape 2-flowered; segments of the perigonium-limb spreading, lanceolate, much surpassing the tube in length; sterile stamens cylindric, short, scarcely half as long as the tube.—Found above the valley Cachinal de la Sierra, lat. 26°4′, at an altitude of 2000 feet.—The scape is 2-flowered; the segments of the perigonium are wide-spreading, lanceolate, much longer than the tube; the sterile stamens are cylindric, nearly half the length of the tube.

Leucocoryne pauciflora R. A. Phil. l. c. 269-270.—Leaves and spathe narrowly linear; umbel 2-/or 3-flowered; peduncles short, equaling the perigonium-tube which is 9 mm. long; segments of the limb ovate-lanceolate; sterile stamens yellowish, half as long as the segments.—Found near Montenegro, not far from Santiago, in October, 1884, by Augustus Borchers.—I have seen three specimens, all alike. The bulb is covered with reddish membranes as in *L. ixioides*, and of the same size. The scape attains a length of 23 cm. There are 3 leaves whose width is almost 1.5 mm. the spathes are to 23 mm. long, the peduncles 10 mm. The capsule is much smaller than that of *L. ixioides*, which is 16 mm. in length and 5 mm. in width; in *pauciflora* it is only 9 mm. long and 4 mm. wide.

Leucocoryne exypetala R. A. Phil. l. c. 270.—Spathe reflexed?; umbels 3—6-flowered; peduncles equalling or surpassing the perigonium-tube; segments of the perigonium narrow, somewhat acuminate; sterile anthers scarcely one-third as long as the segments, attenuate at the base.—Found at Pabellon, near Copiapŏ, by Francisco San Ramon, Caldera. I have seen six specimens, which have all their spathes reflexed. The peduncles attain a length of 22 mm., the tube of the perigonium 8.5 mm., the segments are 15 mm. long and 5 mm. wide; the sterile anthers are 4 mm. long. The form of the perigonium segments is very specific.

Leucocoryne appendiculata R. A. Phil. l. c. 270-271.—Spathe 1-flowered (or few-flowered?), equaling the pedicel; segments of the perigonium ovate-lanceolate, the inner ones slightly smaller than and the outer ones twice as long as the tube; stalk of the sterile anthers about one-third as long as the segment, cylindric, filamentous at the apex.—Bulb collected near Caldera by Paul Ortega and is said to flower in the beginning of September.—The bulb cannot be distinguished from that of *L. ixioides*. There are 3 leaves, opposite the scape, linear, barely 3 mm. wide, fleshy, somewhat fluted above and somewhat keeled beneath, shorter than the scape. The scape is 20 cm. tall, sturdy. The 2 spathes are equal and 35 mm. long, green, only membranous at the tip. The tube of the perigonium is 13 mm. long, its larger segments 26 mm. long, the smaller ones 23 mm.; the width is 10 mm. The sterile anthers are 7.5 mm. long and their appendage barely 1 mm. long.

Leucocoryne violascens R. A. Phil. l. c. 271.—Leaves and spathe narrowly linear (as in the remainder); umbels about 6-flowered; peduncle 2 or 3 times as long as the tube of the perigonium; segments of the perigonium white or pale-violet, after drying deep violet, lanceolate, long-acuminate; sterile stamens one-third as long as the segments.—Collected near Colina in October, 1887.—The bulb is not different from that of *L. odorata*. The scape attains a length of 45 cm. The leaves are practically the same length, 3 mm. wide, odorless. The leaflets of the spathe are narrow, the same length as the peduncles which are 20—30 mm. long. The tube of the perigonium attains a length of 10 mm. and is at length nigrescent, the segments are 24 mm. long and 6 mm. wide. It is peculiar that the very white perigonium turns a marked violet on drying. The narrow form of the perigonium segments which end very gradually in a very large point distinguishes quite well this species and approaches that of *L. oxypetala.*

Leucocoryne foetida R. A. Phil. l. c. 272. —Giving off very strongly the odor of onions; leaves and spathe narrowly linear; umbels 3—5-flowered; peduncles 13 mm. long, equaling the tube of the perigonium; segments of the perigonium white or pale-violet, ovate-lanceolate, acuminate, 29 mm. long, 9—10 mm. wide; sterile stamens pale-reddish, about one-fourth or one-fifth as long as the segments, filiform.—Frequent near Quilpué, a village not far from Valparaiso.—The bulb is about half the size of that of *L. odorata,* which aside from this fact appears very much like it. The scape is only 25 to 30 cm. long and is purple at the base; the leaves are almost the same length as the scape and are 2 mm. wide. The spathes are as long as the peduncles. The flowers maintain their color in drying. The juice has the odor of garlic and therefore is much stronger than that in *L. alliacea.* Our species is distinguished from *L. ixioides* and *L. odorata* by the smaller number of flowers in the umbel, from *L. montana* by the shortness of the peduncles, and from *L. pauciflora* by the shortness of the sterile stamens.

Leucocoryne incrassata R. A. Phil. l. c. 272-273.—Umbel about 7-flowered; pedicles longer than the tube of the perigonium, unequal; segments of the perigonium oblong-lanceolate, equaling the 11 mm. long tube; sterile stamens oblong, thick, about one-third as long as the segments.—Found near Vallenar in February, 1883, by Belisario Rojas.—The spathe measures about 30 mm. long, the pedicles about 2 to 4 cm. The sterile stamens are very much enlarged as in *L. macropetals,* in which the tube of the perigonium is short. This is a unique species in that it flowers at the end of summer; the others bloom in the spring.

Leucocoryne connivens R. A. Phil. l. c. 273.—Scape few-flowered; spathe equaling the pedicels; segments of the campanulate limb narrow, 16 mm. long, scarcely 5 mm. wide; sterile anthers connivent.—It grows near Talca.—A bulb brought from Talca has produced flowers in the botanical garden. It has 3 leaves, somewhat furrowed, to 2 mm. wide. The scape is 22 cm. long, bearing only 3 flowers, and like the leaves is a vivid green. The spathe is dry, purple at the base, the remainder mottled, 2 cm. long, practically the same length as the pedicels, which are unequal, one being shorter than the rest. The flowers are erect and odoriferous at night, drooping and odorless during the day. The tube is green, 10 mm. long, the limb campanulate, the segments are half as long as the tube, somewhat furrowed, white; the mid-nerve of the 3 outer ones is green. The sterile anthers are 9 mm. long.

Leucocoryne coquimbensis R. A. Phil. l. c. 273-274.—Leaves narrow, linear, equaling the scape or slightly surpassing it; umbel up to 5-flowered; bracts scarious, linear-subulate, equaling the perigonium-tube; segments of the hypocrateriform perigonium obliquely ascending and forming a funnel, violet-colored, oblong, rounded or acute, crenate or sublacerate, the throat white; staminodes thick, acute, yellow.—Collected near Coquimbo in September, 1893.—When first encountered this species was mistaken for *L. purpurea,* but it is distinct on account of the large size of the almost white perigonium and the yellow staminodes. The leaves are narrow, linear, and when fully developed surpass the scape, they are at least 28 cm. in length, 2 mm. wide, green. The sturdy scape is 2 mm. thick and is up to 35 mm. long; it produces an umbel of 2—5 flowers, protected by 2 scarious bracts, which are linear, pointed, and reach up to the middle of the perigonium. The pedicels are unequal, in the opened flower they are longer than its tube. The perigonium is of a violet color, with the base of the limb white and the tube greenish; the divisions of the limb are obliquely ascending, apparently joined together in a funnel, oblong, rounded or acute at the apex, the margin very slightly crisped, rarely also laciniate. The tube measures up to 11 mm. in length, the divisions 18 mm. long, and the diameter of the funnel up to 26 mm. in the larger flowers. The staminodes are yellow, conic, and measuring 4 mm. in length.

THE CHROMOSOMES OF THREE MEXICAN **HABRANTHUS** SPECIES *

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Habranthus has been considered as essentially a South American genus. The Texas *H. andersoni* var. *texanus* Herb. (or *H. texanus* Herb. ex Steud.) was long thought to be the lone North American representative, and there has been doubt as to its being indigenous (see Flory, 1938). The genus has been considered as being composed of species with either 12 or 24 comparatively large chromosomes; or, where numbers differed from these they could be attributed to known hybridity, or to aneuploiddy (Flory, 1948).

In recent years a number of amaryllidaceous species, several of them previously undescribed, have been collected in Mexico. Mrs. Morris W. Clint has been particularly active in collecting and studying these Mexican plants, and she is most generous in sharing her collections and information concerning them. Several of the recently collected Mexican taxa are apparently *Habranthus* species. The present paper is a report on the chromosome numbers of three of these Mexican species which are closely allied with and are now considered as belonging to *Habranthus*. Some other cytological observations are mentioned, and other pertinent considerations are treated briefly. It will be noted that the chromosome numbers of these species differ from those previously reported for others in the genus. A more complete karyotype analysis and phylogenetic treatment of all available *Habranthus* taxa is being given elsewhere (Flory and Flagg, 1958).

Habranthus immaculatus Traub and Clint (2n=22)

This species was first collected in the State of Guanajuanto, Mexico, in 1954, and was described in 1957 (Traub and Clint). The plants worked with here carry our No. 13162-55 and are Mrs. Clint's No. 610. The somatic chromosome number of the species is 22 (Plate 3, A). The following types may be distinguished:

4 long; median constrictions
4 slightly shorter, but long; submedian constrictions
6 medium length ones; submedian constrictions; and
8 short; submedian constrictions.

Of the last eight, two are shorter and more nearly median than the others.

The number is the same as found in many species of the family. The species of *Amaryllis*, for example, have 22, or higher multiples of eleven, chromosomes. In *Amaryllis*, however, the long chromosomes with median centromeres are not found, as a rule, and there are other differences (Ficker, 1951; Schmidhauser, 1954) from the chromosomes in the

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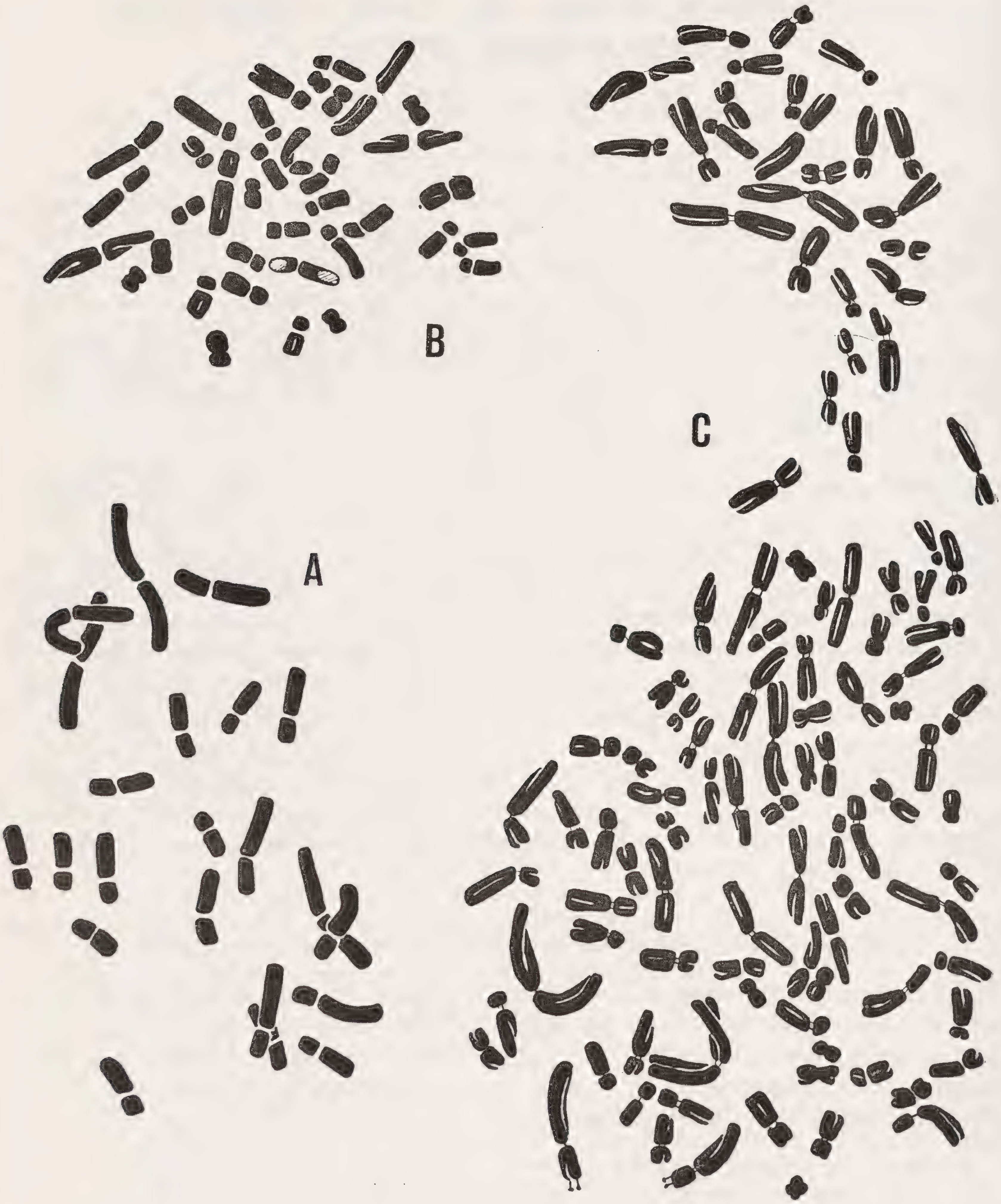

Chromosomes at somatic metaphase are shown for three *Habranthus* species. A. *Habranthus immaculatus*, 2n=22; B. *Habranthus concolor*, 2n=36; and C. *Habranthus* sp. (13462-56), 2n=108. All figures are camera-lucida drawings made at an initial magnification of ca. X2500, and reduced to approximately X1250 in reproduction.

Chromosomes in each of the three figures were shortened and spread by action of the following pretreatments for the indicated times: A. Colchicine, .2%, 6 hours; B. Paradichlorobenzene (saturated), 5½ hours; C. Colchicine, .2%, 3½ hours.

Plate 3

Habranthus immaculatus complement.

Habranthus concolor Lindl. ($2n=36$)

This species was originally described by Lindley in 1845. It was moved to *Hippeastrum* by Baker (1878), and later the same author (1888) transferred it to *Zephyranthes.* The plant was probably never in cultivation, and had not been collected for many years until Mrs. Clint reported it from several locations in the states of San Luis Potosi and Aguascalientes, Mexico (Clint, 1955). The accession number of the present plants is our No. 13183-54.

The present authors have not flowered this species. The two excellent specimens pressed and sent by Mrs. Clint for this study, have stamens of four slightly, but distinctly, different lengths and the stamens and style are fascisculate-declinate-ascending. The bulbs, the width of the leaves, and the whole general appearance of the plants would indicate this to be an *Habranthus* species. Both Mrs. Clint and Dr. H. P. Traub have indicated their belief that this should be placed in *Habranthus.* Because of the tangible and intangible character distinctions, and with the support of the two mentioned students of the group, we are considering this species as an *Habranthus.* The perigone usually is slightly declined, although an occasional erect perigone is suggestive of *Zephyranthes.*

Habranthus concolor has 36 somatic chromosomes. (Plate 3, B) They are made up of the following types:

4	long; median constrictions
4	long; submedian constrictions
4	medium; subterminal, approaching submedian
18	medium to short, graduated; submedian
6	short (2 shorter than others); median constrictions

Actually, as in the metaphase figure drawn (Plate 3, B), there may only be three of the long, median chromosomes—at least in some complements. Translocations may occur—to shorten some chromosomes and lengthen others—as apparently occurs in some other *Habranthus* species (Flory and Flagg, 1958). Since there are slight graduations among the longer chromosomes, it may be that further study will show the 12 longest to be made up of four groups of three each—rather than three groups of four each, as suggested above.

Most *Habranthus* species studied have one or two pairs of long chromosomes with median centromeres, and most *Zephyranthes* species have their longest chromosomes with submedian constrictions (but some, as *Z. pulchella* J. G. Smith and *Z. grandiflora* Lindl., have a pair with nearly median constrictions). Chromosome types of this species would, accordingly, be more suggestive of *Habranthus* than of *Zephyranthes,* but this evidence is not critical. The number would fit in with the most common euploid series (based on $x=6$) in both genera.

Habranthus sp. ($2n=108$)

The plants studied here carry our accession number 13462-56, and are from two bulbs received from Mrs. Clint (her No. 565-A), originally collected from the Zimipan-Jacala area, Hidalgo, Mexico. These glaucous leaved plants produce white flowers and appear to be a new and undescribed species of *Habranthus.*

A typical somatic metaphase figure is drawn in Plate 3, C showing 108 chromosomes. Earlier counts for this species had indicated a somewhat lower number, but several unbroken cells with fairly well spread elements now show the higher count (2n=108) to be the correct one.

Long chromosomes with medium centromeres, long submedian ones, medium lengthed submedian ones, medium subterminal ones, and short chromosomes with median and with submedian centromeres are present here. The exact proportion of each has not been determined. It is apparent that there are fewer long chromosomes and more medium lengthed and short ones, and also that those with submedian centromeres are most prevalent in all groups. In other words, the types and the proportions of each type approximate those observed in other *Habranthus* species.

Summary

Somatic numbers, and brief descriptions, are given for the chromosomes of three Mexican species considered as belonging to the genus *Habranthus.* Two of these were recently collected for the first times: *H. immaculatus* having 22 chromosomes, and *Habranthus* sp. (No. 13462-56—undescribed) with 108 chromosomes. *Habranthus concolor,* first collected over a hundred years ago and long considered a species of *Zephyranthes,* has 36 somatic chromosomes. All three numbers are new to the genus. Chromosome types and general morphology are consistent, for the most part, with those encountered in other species of *Habranthus.*

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THE CHROMOSOMES OF **ZEPHYRANTHES INSULARUM, Z. PUERTORICENSIS** AND **Z. NERVOSA** *

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Traub (1958) recently brought considerable clarification to the confusion in nomenclature involving the three species listed in the title of this paper, as well as *Zephyranthes tubispatha* (L'Heritier) Herb. ex Traub, *Z. commersoniana* Herbert and *Habranthus robustus* Herbert ex Sweet. As Traub indicated, one source of evidence upon which he based his views was cytological data furnished by the present writer. A recent brief abstract mentioned the chromosome numbers involved (Flory, 1958a). The details of the cytological work are largely unpublished and are being presented here for the three species listed. Material of *Z. tubispatha* (L'Hert.) Herb. ex Traub and of *Z. commersoniana* Herbert has not been available. The chromosomes of *Habranthus robustus* have been described elsewhere (Flory, 1938; Flory and Flagg, 1958), and hence are only briefly mentioned in this paper for comparative purposes.

METHODS

All chromosome studies were made on mitotic divisions occurring in root tip cells. Excised root tips were treated from three to four hours in an aqueous solution of .2% colchicine. Following pretreatment the tips were fixed in 1:3 acetic-alcohol for about 24 hours, and then squashed in either aceto-carmine or acetic-orcein. Observations were made from these preparations and all drawings were made at an original magnification of X2500. The figure legends indicate the magnifications as reproduced.

Where pretreatment chemicals, such as colchicine, are used, varying degrees of chromosome contraction are encountered, sometimes within the same root tip. Shortening of the chromosomes following pretreatment makes for ease of counting and facilitates the observations of some details. It hinders the observation, however, of satellites, of constrictions, and of the most reliable comparison of the chromosome lengths of different taxa.

The ratio obtained by dividing the length of the short arm of a chromosome by its total length (S.A./T.L. ratio) has been used as a means of comparing chromosomes, or groups of chromosomes. This ratio gives the proportionate part that the short arm length is of the total length.

OBSERVATIONS

Zephyranthes insularum Hume ex Moldenke, $2n=28$

This species was first described by Hume (1939) with Moldenke (1952) supplying the description in Latin. It has 28 somatic chromo-

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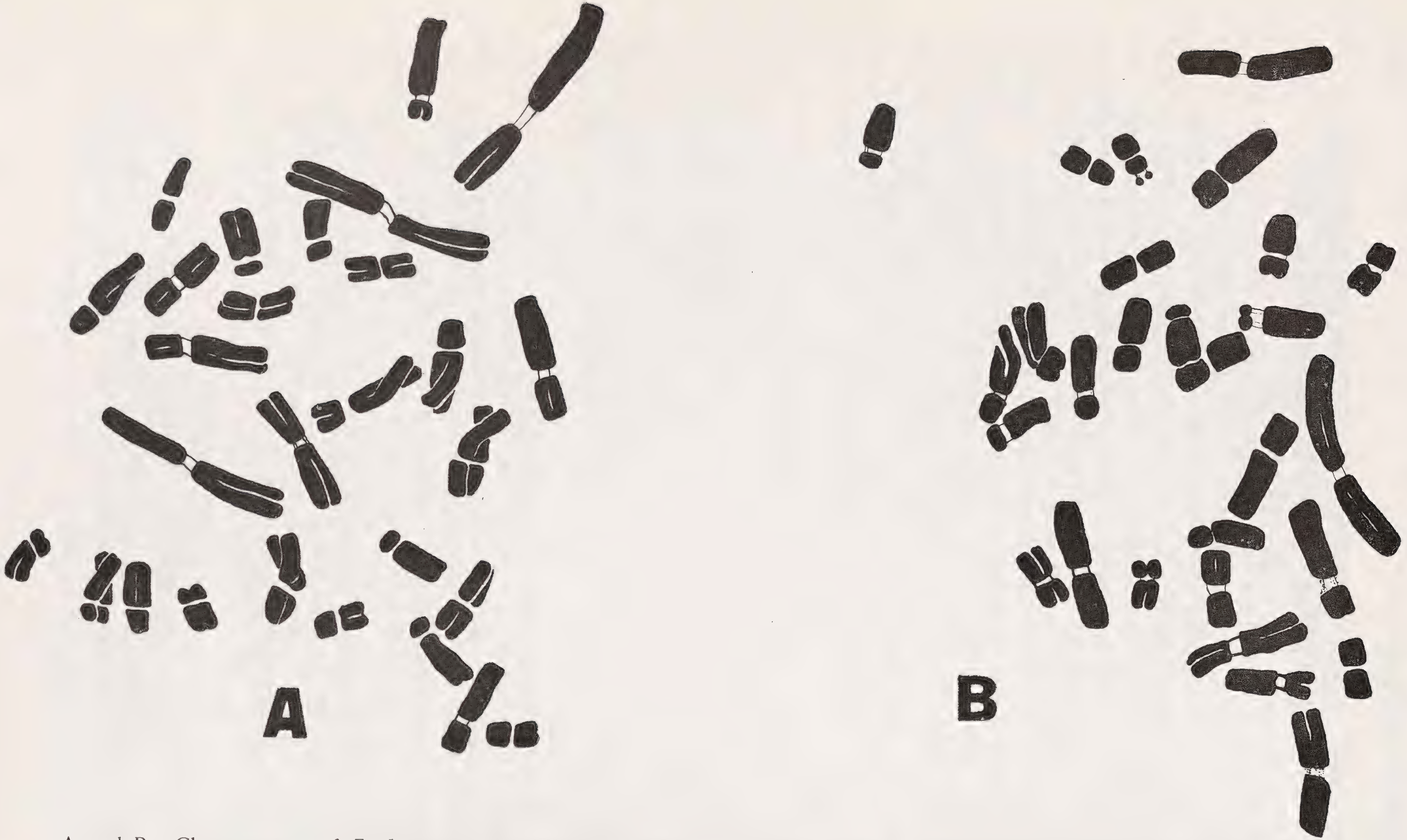


A and B. Chromosomes of *Zephyranthes insularum* at somatic metaphase. Aceto-carmine squash preparations following pretreatment with .2% colchicine for 4 hours. Original magnifications X2500. Reduced to X1500 in reproduction.

Plate 4

somes and since there are some slight deviations apparent from cell to cell two metaphase figures are shown (Plate 4, A and B).

The members of one chromosome complement have been arranged, from left to right, in approximate descending order of their lengths (Fig. 5, A). The chromosomes of six somatic metaphase figures have been measured. Similar chromosomes have been grouped, with average length data being presented in Table 1, along with indices arrived at by dividing the length of the short arms by total chromosome lengths (S.A./T.L.).

Table 1. The chromosomes of **Zephyranthes insularum** and of **Z. nervosa**, arranged in groups based on length and centromere position.[1]

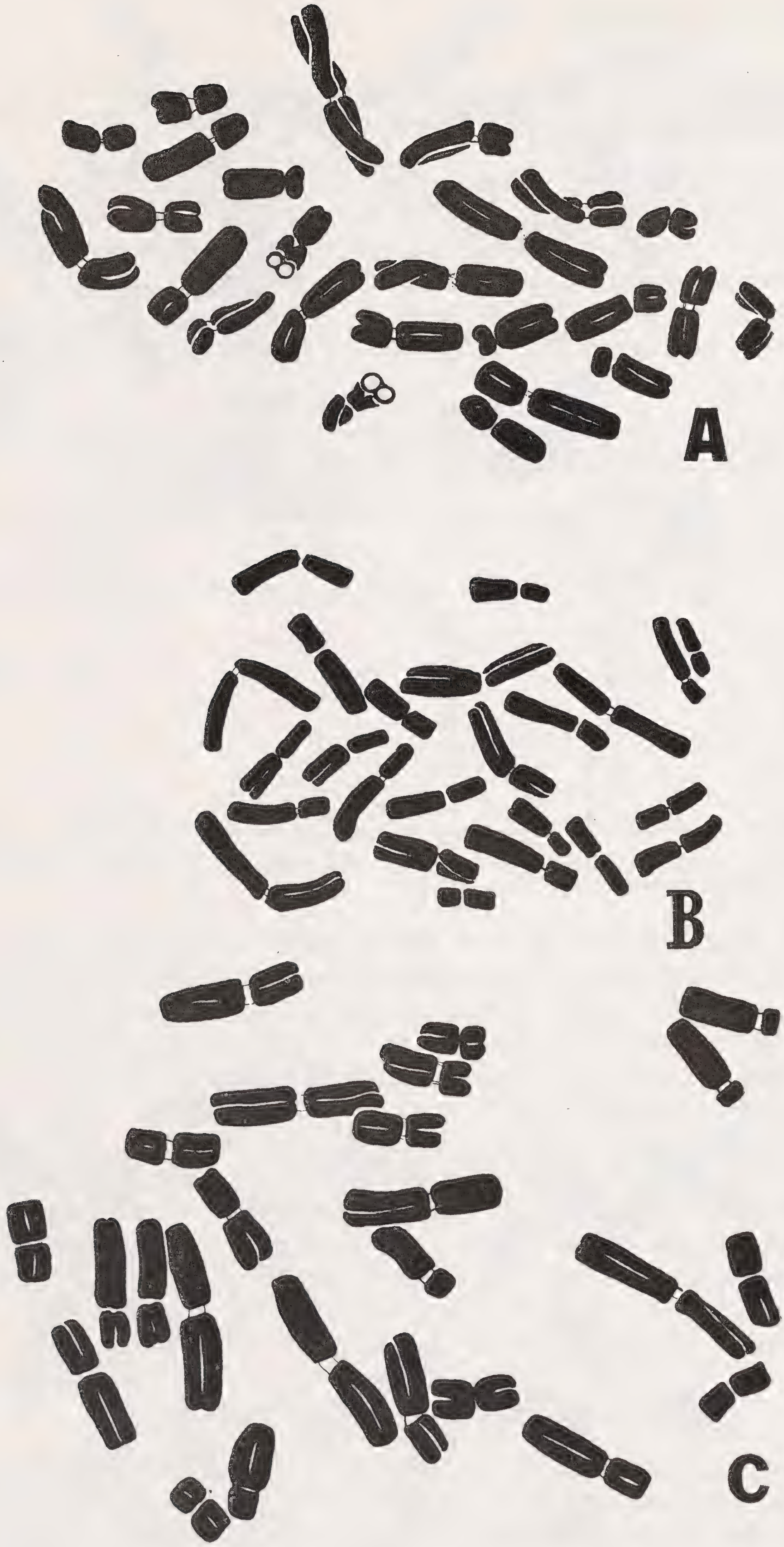
	Z. insularum			**Z. nervosa**		
	Number	Lengths in microns	**S. A.** / T. L.	Number	Lengths in microns	**S. A.** / T. L.
	3	14.5	.45	2	12	.45
	3	8.5	.39	2	11	.44
	3	7	.25	2	8.5	.35
	4	6.5	.35	4	8	.31
	3	6	.46	4	7	.34
	6	5	.25	4	6	.47
	3	4	.49	4	5.3	.42
	3	3.5	.43	2	4	.40
Total:	28	186.5		24	176.2	

[1] Centromere position—as indicated by the ratio of the short arm divided by total chromosome length (S.A./T.L.).

It will be noted that there is considerable variation in length and in morphology of the several chromosome groups. The longest are more than four times the length of the shortest ones. Members of the longest group, of the two shortest groups, and of one intermediate group have almost median centromeres (with S.A./T.L. ratios of .45, .49, .43 and .46, respectively). Chromosomes in the other intermediate lengthed groups have either more sub-median (ratios of .39 and .35), or nearly sub-terminal (S.A./T.L. ratios of .25) centromeres. Observation of the several figures (Plate 4, A and B; Fig. 5, A) reveals that in several of the chromosome groups there is some discrepancy in the total length, and also in centromere position, when chromosomes of the same approximate type are compared. This is especially evident, perhaps, when groups with the longer chromosomes are considered (Fig. 5, A).

Zephyranthes puertoricensis Traub, 2n=25

This taxon, named by Dr. H. P. Traub in 1951, was the first *Zephyranthes* species described from Puerto Rico. Bulbs received from Dr. Traub proved to be practically identical cytologically with the form carried in the writer's cultures as "*Z. tubispatha.*" Bulbs under the name of "*Z. tubispatha*" had been secured from several different private and commercial sources over a period of twelve years. Root-tip cells of "*Z. tubispatha*" had consistently shown 25 chromosomes at metaphase



Chromosomes of *Zephyranthes* taxa at somatic metaphase. Aceto-carmine squash preparations after .2% colchicine for 4 hours. Original magnifications X2500. Reduced to X1725 in reproduction. Plate 5, A. *Z. puertoricensis*. Plate 5, B. *Z. nervosa*. Plate 5, C. "*Z. tubispatha*."

Plate 5

(Plate 5, C). In *Z. puertoricensis,* also, there were found 25 somatic chromosomes (Plate 5, A), and these proved to be very similar morphologically to those of "*Z. tubispatha,*" from Jamaica (compare B and C, Fig. 5).

After a review of the nomenclature, and consideration of the cytological similarities just mentioned as well as the morphological likenesses, Traub (1958) has concluded that the two belong to the same species. Ker-Gawler's (1813) misapplication of the name of a different South American species to this entity, led to a confusion in nomenclature that persisted for almost a century and a half. A five-step summary is given below of Traub's (l.c.) discussion of the history of the nomenclature involved and its clarification.

Amaryllis tubispatha L'Héritier de Brutelle (Sert. Angl. 9, 1788) A red-flowered species, from Argentina.

"*Amaryllis tubispatha* Ker-Gawler" (Curtis's Bot. Mag., pl. 1586, 1813) A white-flowered species, from Jamaica. Herbert 1821 and 1837; Sealy, 1954 as "*Zephyranthes tubispatha.*"

"*Zephyranthes tubispatha*" of commerce is the Jamaican form to which Ker-Gawler erroneously applied the name "*Amaryllis tubispatha.*"

Zephyranthes puertoricensis Traub in Plant Life 7: 37-38. 1951. A white-flowered taxon from Puerto Rico. The same as Ker-Gawler's "*Amaryllis tubispatha.*" Also the same as "*Z. tubispatha*" of commerce.

Zephyranthes puertoricensis Traub is the correct name for "*Z. tubispatha*" Herbert, which is the erroneously labeled "*Z. tubispatha*" of commerce.

The average lengths for the chromosomes of the several different types encountered in *Z. puertoricensis,* as well as the S.A./T.L. ratios for these types, are presented in Table 2, as based on measurements from four typical metaphase figures. A representative complement is arranged for chromosome comparison in Fig. 5, B. The longest chromosomes are seen to be approximately three times the length of the shortest. As with *Z. insularum,* chromosome groups are found with near-median, with sub-median, and with near-subterminal centromeres, but with differing proportions of the several types occurring in the two species. On the basis of length and of arm ratio there are six different groups of chromosomes. One of these groups seems composed of a single member (the middle chromosome, Fig. 5, B).

Similar data is also presented in Table 2 on the chromosomes of the bulbs earlier received under the name of "*Z. tubispatha.*" These data are based on average figures from six different slide preparations, involving three bulb accessions. It is evident that the chromosome groups, the approximate length of the members in the different groups, and the S.A./T.L. ratios are all identical or very similar to those for *Z. puertoricensis* chromosomes. The chromosome which apparently occurs alone is also the thirteenth one, or the one of intermediate length. The chromosome picture for *Z. puertoricensis* and for "*Z. tubispatha*" is practically identical. The slight difference in lengths could very well be due to variations in contraction following pretreatment.

Table 2. The chromosomes of **Zephyranthes puertoricensis** and of **"Z. tubispatha,"**[1] arranged in groups based on length and centromere position.[2]

	Z. puertoricensis			**"Z. tubispatha"**[1]		
	Number	Length in microns	**S. A.**/T. L.	Number	Length in microns	**S.A.**/T. L.
	3	10.6	.45	3	11.6	.48
	3	7.6	.42	3	9.4	.43
	6	7.2	.36	6	7.6	.34
	1	5.8	.38	1	6.8	.35
	4	5.4	.26	4	5.8	.28
	8	4.4	.45	8	5.0	.44
	—	———		—	———	
Total:	25	160.4		25	178.6	

[1] This is the Jamaican form apparently identical with and the same as **Z. puertoricensis;** not **Z. tubispatha** (L'Hérit.) Herb. ex Traub.

[2] Centromere position—as indicated by the ratio of the short arm divided by total chromosome length (S.A./T.L.).

Zephyranthes nervosa (H. B. K.) Herbert, 2n=24

Small bulbs of this species from Venezuela, raised from seeds collected by Dr. Tobias Lasser within the type locality, and supplied by Dr. H. P. Traub, proved to be of very difficult culture. They were not flowered by the writer. Before all bulbs were finally lost, a few actively growing root tips were secured and the following chromosome description resulted from a half dozen or so clear metaphase figures observed in preparations from these tips.

The 24 somatic chromosomes of *Zephyranthes nervosa* (Plate 5, B) do not show as wide a range of variation as was found in *Z. insularum.* The longest chromosomes of *Z. nervosa* are about three times the length of the shortest. While a number of the chromosomes have centromeres located at near-median positions, the others have sub-median centromeres and no subterminal ones—with one very short arm—were observed in this species (Fig. 5, D). Length and arm ratio data for the several chromosomes groups of this species, averaged from measurements of two metaphase figures, may also be found in Table 1. The chromosomes of this species appear to be more evenly paired, as to length and arm ratios, than are those of *Z. insularum* and *Z. puertoricensis.*

Habranthus robustus Herbert, 2n=12

Herbert (1837) suggested that this species from Buenos Ayres was the same as *Amaryllis tubispatha* L'Herit. (=*Z. tubispatha* (L'Herit.) Herb. ex Traub) collected by Commerson, also at Buenos Ayres. Traub (1958) has effectively shown the error of Herbert's suggestion, in view of the numerous morphological distinctions separating the two species. Only one of these two species has been available for cytological study. It seems pertinent to point out that previous studies (Flory, 1938) have shown *H. robustus* to have 12 long chromosomes, among which six pairs may be clearly distinguished, with a combined length at somatic metaphase (in preparations without pretreatment) of about 204 microns. The twelve chromosomes of one metaphase figure have been arranged in order of length (Fig. 5, E) for comparison here with the chromosomes of the *Zephyranthes* species being reported on cytologically.

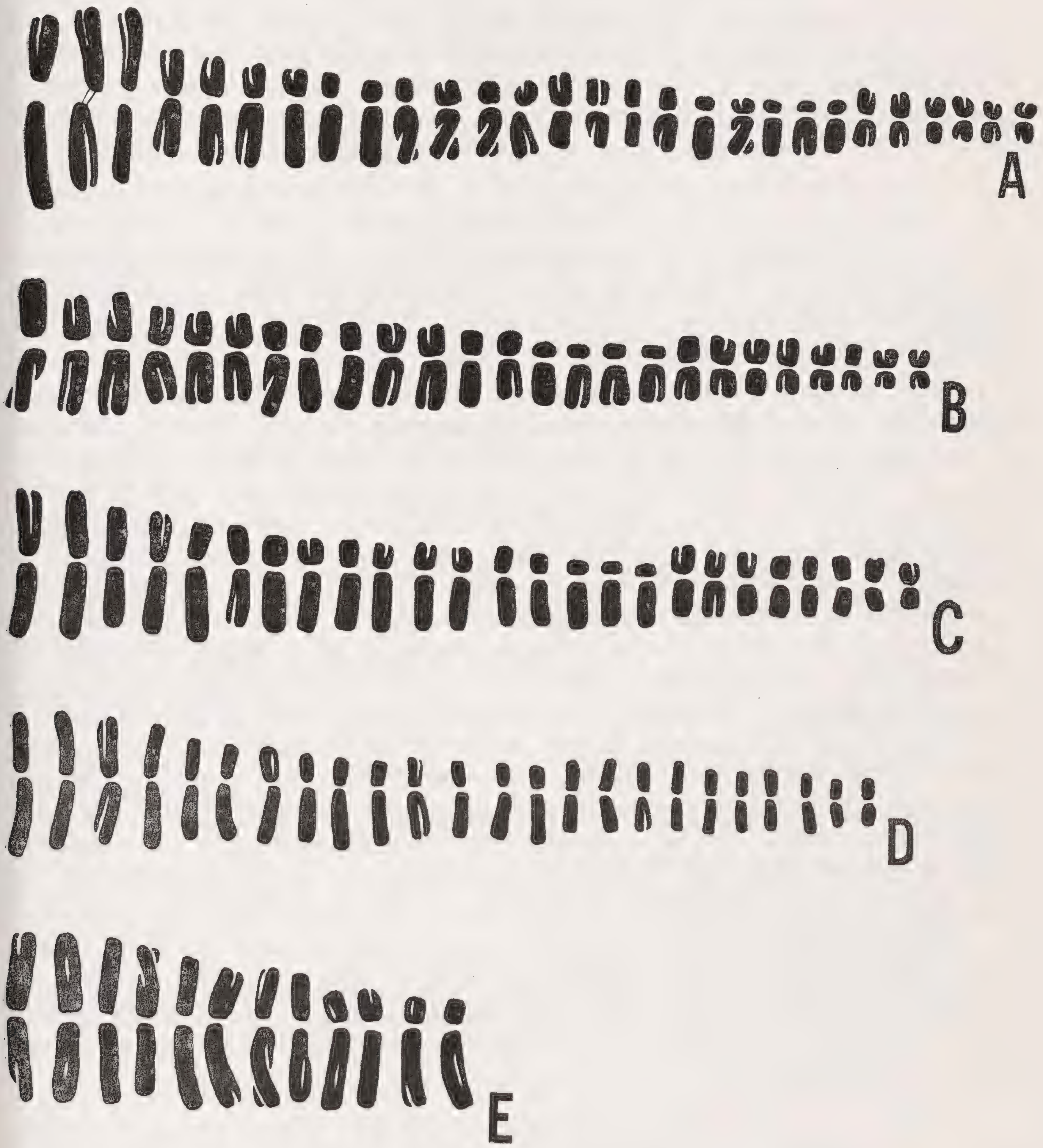


Figure 5. Chromosome complements of several taxa, drawn at somatic metaphase. In general, chromosomes are arranged from left to right in order of decreasing length. Aceto-carmine squash preparations following .2% colchicine for 4 hours. Original magnification X2500. Reduced to X1250 in reproduction. Fig. 5, A. *Zephyranthes insularum.* Fig. 5, B. *Z. puertoricensis.* Fig. 5, C. *"Z. tubispatha."* Fig. 5, D. *Z. nervosa.* Fig. 5, E. *Habranthus robustus.*

DISCUSSION

The geographic distribution of the three species being dealt with is of interest and of possible phylogenetic importance. *Zephyranthes* *puertoricensis* occurs in Puerto Rico and also some 600 miles to the west, across the Caribbean Sea, in Jamaica. *Zephyranthes nervosa* occurs in Venezuela about 500 miles south of Puerto Rico, and also separated from it by the Caribbean. The exact native home of *Z. insularum* is not known; Hume obtained it from Cuba and found it growing in Key West, Florida along with *Z. rosea* which is also from Cuba. It was presumed that its home was in Cuba (Hume, 1939)—which is just north of Jamaica, or at least some place in the West Indies (Traub, 1958).

It has been mentioned above, that in *Z. insularum* some chromosomes vary somewhat in length and also in centromere position from all others in the complement. One explanation of this is the possible occurrence of translocations. Another possible explanation is that this might be a hybrid taxon, with some chromosomes being contributed by one species, while the others are derived from a second species.

In *Z. puertoricensis* we have the rather unusual situation of an odd number of 25 somatic chromosomes, occurring quite consistently in cells of the same plant and in accessions from different sources. The occurrence of this same anomalous condition in the taxon long carried as "*Z. tubispatha* Herbert", provides—along with their morphological similarities—a good basis for believing the two identical. This aneuploid is probably a pentasomic tetraploid ($4x+1$), since there is reason for believing 6 to be the basic number in the genus. Presumably the aneuploid condition arose through the occurrence of an aneuploid ($n+1$) gamete, which united with a normal (n) gamete. The data in Table 2, as well as Figs. 5, B and 5, C, indicate that at the present time the complement of this species is not made up of exactly five sets of four plus a sixth set of five chromosomes—although this condition is approached. Translocations could account for the deviating chromosomes encountered here. It is probable that ready vegetative propagation, such as occurs here by bulblet offsets, tends to promote the survival of this and of other cytological variants (see Flory, 1958b).

Baker (1888) reduced *Z. nervosa* to synonomy with the species now known as *Z. puertoricensis*. Traub (1958) has pointed out the differences between the two species, and how Baker erred. The present study shows the differences which exist in chromosome number and morphology between the two taxa.

While this work points out cytological differences which occur between *Z. insularum, Z. puertoricensis* and *Z. nervosa,* it may also be used as a basis for noting some chromosome similarities. For instance, consider the chromosomes of the three taxa on the following grounds:

	Number	Total length (microns)
Z. insularum	28	186.5
Z. puertoricensis	25	171.3[1]
Z. nervosa	24	176.2

---

[1] Average of 10 figures, four of *Z. puertoricensis* and six of "*Z. tubispatha.*"

The numbers do not vary greatly, and the total length of all chromosomes at metaphase is essentially the same for all three species, especially when possible differences in contraction are taken into account.

It is not too difficult to imagine that the ancestral forms of any two of these species, or those of perhaps all three of them, may have played at some time on the same evolutionary stage during the period when the species developed. Neither cytological or morphological facts, nor geographic distribution, would seem to deny this possibility.

SUMMARY

Somatic chromosome counts of 28, 25 and 24 are reported for *Zephyranthes insularum, Z. puertoricensis,* and *Z. nervosa,* respectively. Measurements and descriptions are given for the several chromosome types encountered. The cytological observations strengthen Traub's clarification of the nomenclatural confusion in which these species have been concerned. Suggestions are made of factors possibly having a bearing on the evolution both of the species and of their karyotypes.

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SPREKELIA — 'HARRISON'S ORIENTRED'

HAMILTON P. TRAUB

Recently Mrs. Morris Clint and others have made determined efforts to collect from the wild and also from gardeners the various forms of *Sprekelia formosissima.* So far more than a dozen lots have been collected by Mrs. Clint which she has shared with the writer. The various forms will be described as they are studied in detail.

One of the outstanding clones noted so far was obtained by Mrs. Clint from Mr. Frank Harrison of Rancho del Cielo, in Mexico. This clone has been named 'Harrison's Orientred'.

Bulb fairly large with a long neck. Leaves linear, acute, light green, up to 7 or more, furrowed on the upper side, 1.5 cm. wide, 50—51 cm. long. Scape hollow, flattish, produced from side of bulb-neck, 22.5 cm. long, 8 x 11 mm. in diam. at base, 6 x 7 mm. in diam. at apex. Spathe monophyllous, 8.7 cm. long, united for 3.5 cm. toward the base, free portion above fenstrate, reddish-colored; bracteoles very much smaller. Pedicel 5.2 cm. long. Ovary 1 cm. long, 8 mm. in diam. Perigone of typical *S. formosissima* shape, bright orient red (HHC 819), tepalsegs with a greenish-whitish stripe in lower 2/3, top setseg shortly greenish-whitish toward the base, the two side setsegs greenish-whitish on upper margins for ¼ of their widths, and margined whitish up to about 2/3 of the margin length. Stamens and style fascisculate, declinate ascending, greenish-whitish in extreme lower part, rest orient red. Stamens of four sets of lengths, the longest subequaling the bottom petseg, and the two side petsegs. Style longer than tepalsegs, stigma trifid, lobes slightly recurved.

AMARYLLID NOTES, 1959

Hamilton P. Traub

In the past a number of varieties have been recognized in *Amaryllis striata* Lamarck, Encyc. Bot. 1: 125. 1783. All of these, with the possible exception of var. *fulgida* are not sufficiently distinct to rank even as forms.

Amaryllis striata forma *fulgida* (Ker-Gawl.) Traub, *comb. nov.* (syn.-*Amaryllis fulgida* Ker-Gawl., in Bot. Reg. 3: pl. 226. 1817.

Notes.—This is a more vigorous form with a 4-flowered scape, and beautiful nasturtium red flowers.

The forms that have been recognized as varieties, including *A. striata* var. *crocata* (Ker-Gawl.) Traub & Moldenke, Amaryll. 116-117. 1949; *A. striata* var. *acuminata* (Ker-Gawl.) Traub & Moldenke, l. c. p. 117; and the variety *citrinum* Baker, Amaryll. 51. 1888, are not sufficiently distinct and are reduced to the type, *Amaryllis striata* forma *striata.*

[**LYCORIS RADIATA—HAYWARD,** continued from page 80.]

damage or disease, and they will bloom every year if the mother bulbs are dug and separated; if not all in a planting, at least most of them, especially those most seriously crowded.

"I never saw a bulb set seeds. The China type seems to have lost this faculty. But they multiply rapidly by offsets in good culture, will stand cold and freezing weather in North Florida safely, growing right along despite the cold and showing no injury. In North Florida I recommend planting them in beds about 4 to 6 inches apart, and let them stay in the ground several years before disturbing the crop. This will make a better show of blooms. When dug and held out of the ground in storage the bloom may be lost.

"*L. radiata* makes its foliage in the Fall and winter, the leaves die off in late spring, and the bulbs are dormant nearly all summer, blooming in mid or late summer."

3. GENETICS AND BREEDING

AMARYLLIS EVANSIAE AND HYBRIDS

IRA S. NELSON

Amaryllis evansiae Traub et Nelson was first described in Baileya (4: 85-88, figs. 30-31. 1956); and it was illustrated there and in Bulletin No. 1 (1956), Louisiana Society for Horticultural Research. The species was collected by writer under the sponsorship of that Society in Bolivia in 1954.

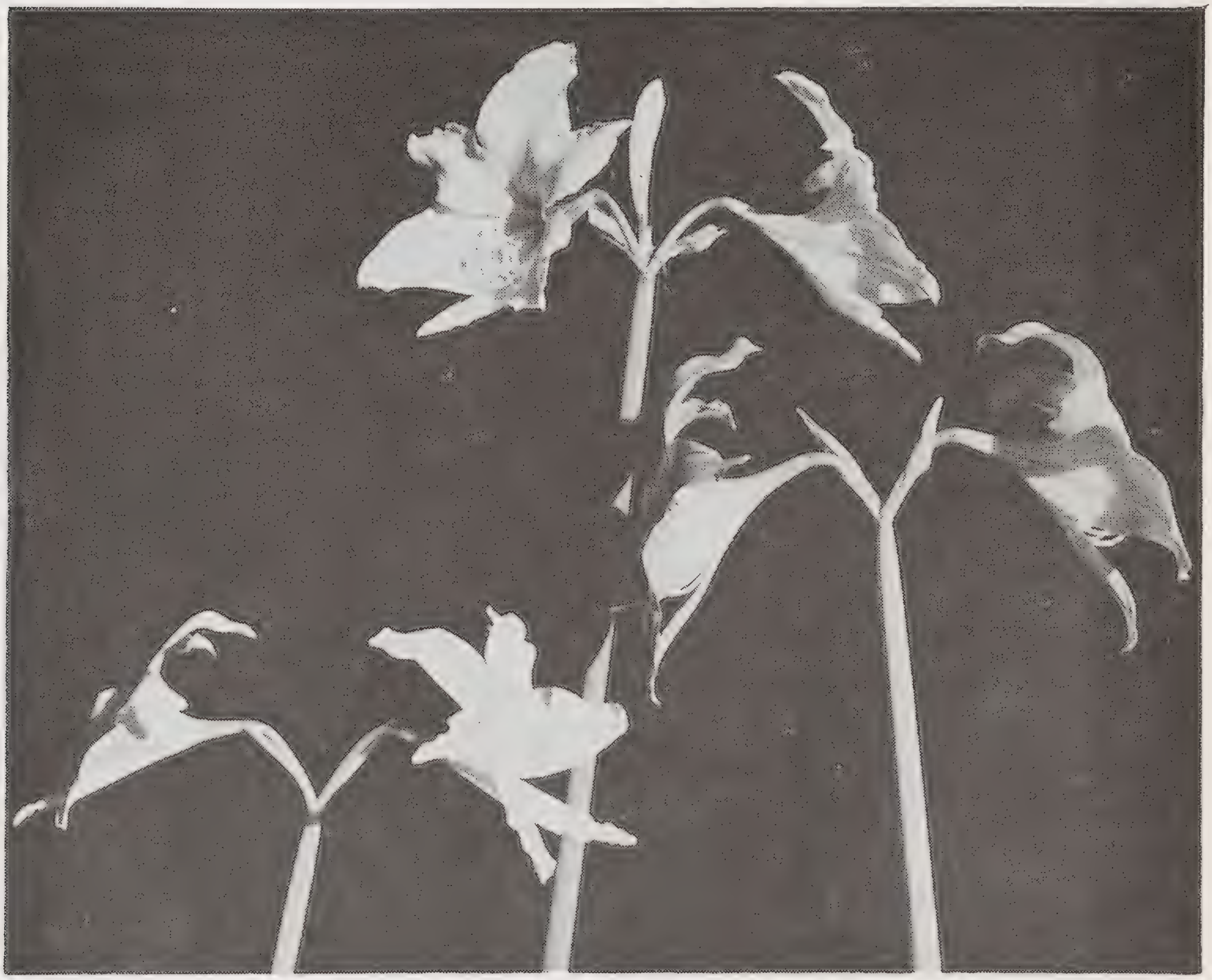

Fig. 6. Left to right, *Amaryllis evansiae;* hybrid *A. evansiae* x *A. striata* forma *fulgida;* and *A. striata* forma *fulgida.* All side view.

Amaryllis evansiae is very interesting since it is the first known in the genus to show marked variations within the species. In all the other 47 species, variation within the species is slight, even in *Amaryllis belladonna* L. which has a very wide range from Mexico, West Indies southward to Bolivia.

Such characters as leaf shape and length, bulb size and shape, and so on, are fairly uniform in *Amaryllis evansiae.* However, as shown in Figs. 6 & 7, the flower shape varies considerably. Although the stigma is usually capitate (obscurely 3-lobed), a distinctly 3-lobed stigma (with short rounded lobes) has been observed in a few individuals. The flower color varies considerably from very pale yellow, chartreuse (very light green) and pastel shades. All of this lends support to the hypothesis that this species is of relatively recent origin and not sufficient time has elapsed to allow for a stabilization of all of the characters.

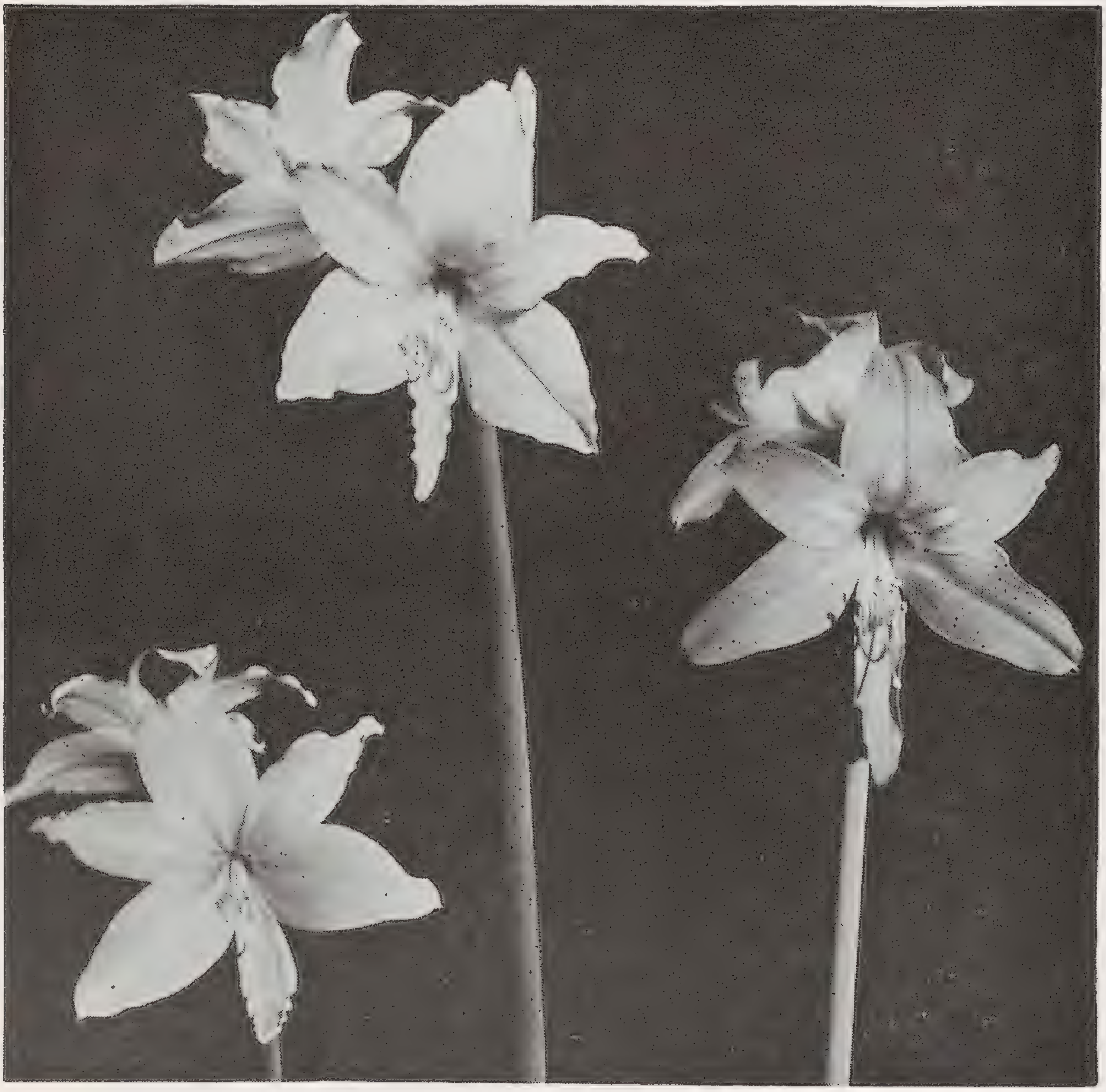

Fig. 7. Left to right, *Amaryllis evansiae,* hybrid, *A. evansiae* x *A. striata* forma *fulgida;* and *A. striata* forma *fulgida.* All front view.

Amaryllis evansiae is readily propagated from seed and it is hoped that nurserymen will soon list it for sale in their catalogs. Because of the variation within the species superior sorts should be selected and propagated vegetatively. Both wide and narrow-segmented selections should be made in at least three color groups—near white, yellow and pastel pinks.

Hybrids between *A. evansiae* and the following species and hybrids were made during the 1955 and 1956 flowering seasons: *A. belladonna* (red); *A. belladonna* (pink); *A. striata; A. reginae; A. pardina;* Dutch hybrid (white); and Mead hybrid (near white).

Two major objectives were in mind when these crosses were made. One was the production of small-flowered sorts in a wide range of colors and the other a large yellow-flowering Amaryllis. The first of these hybrids to bloom is the *A. evansiae* X *A. striata* cross.

This hybrid bloomed in late January 1958. In general appearance it resembles *A. evansiae* but has the trifid stigma, long stamens, obscure paraperigone and pollen color of *A. striata.* Its scape is slightly taller than those of either parent, thus showing hybrid vigor, but the flower size is intermediate (Figs. 6 & 7).

The flower color of this hybrid is light shell pink with a pale green throat inside and cream-colored outside. This combination of pastel colors makes it a desirable addition to the growing list of Belladonna Division (D-3) Amaryllis.

While *A. evansiae* is a splendid species and worthy of a place in any collection, it conceivably may have even more value as parent stock for new hybrids types in the future.

EXPERIENCES IN BREEDING CRINODONNAS

MRS. POLLY ANDERSON, *California*

Crinodonnas seem to come few and far between, but over a period of ten years I have been able to get 28 seedlings of the true cross of *Brunsvigia* by *Crinum,* from several hundred attempted pollinations and thousands of resulting seeds.

My first crosses were on the very late flowering, small, bright rose and white Cape Belladonna, *Brunsvigia rosea minor.* This variety is always small flowered and short and many shades brighter in color than the common Cape Belladonna and fully a month to six weeks later in flowering. The Pink *Crinum moorei* blooms about the same time for me, whereas a lighter form, nearly white, blooms earlier, about the same time as *C. powellii.* Out of several hundred seed from this *B. rosea minor* by Pink *C. moorei,* only 2 had the persistent foliage and characteristics of the *Crinodonna* cross. In four years the first one bloomed (before any of the sister seedlings of pure Cape Belladonna, *Brunsvigia rosea* did). The flower is not anywhere nearly as attractive as *Crinodonna corsii* clone 'Fred Howard' as it is smaller and has kept its tubular shape instead of opening up its face, but the color is a nice creamy flesh color. The non-hybrid sisters bloomed when 5 and 6 years old and were similar to *Brunsvigia rosea minor,* the Cape Belladonna, with deep color petal tips and white throats, thus they were either self pollinated, or as Mr. Hannibal suggests, they were stimulated to produce parthogenetic seeds.

The next year I had some *Brunsvigia* x *multiflora* bulbs from Mr. Hannibal to use as seed parents including also 'Hathor' and *B.* x *multi-*

flora alba. Again I used *Crinum moorei* pollen on all of these, using the pollen of the lighter form on the white brunsvigias and the pollen of the pink *C. moorei* on the hybrid *Brunsvigia* forms. These many crosses resulted in 26 true hybrids out of a thousand or more seedlings, not a very high percentage. These are just starting to bloom now. These are very nice open faced shapes, one rather large white on 3½ ft. stems had 16 blossoms and large healthy looking foliage. Another is a light shade of pink, 2½ ft. tall with 8 flowers, and the one just blooming now is nearly white with a pink picotee edge when first opening, which later spreads inward a bit and softly blends into the white. This also is 2½ ft. tall and has 10 flowers. These seem to bloom more quickly and finish sooner than the *Brunsvigia rosea* forms. It was noted that the white one sent up another scape, which will more than compensate for the short duration of bloom. Strangely, the foliage of these hybrids is much more attractive than that of either parent. It is truly evergreen and in very good shape at blooming time, whereas the foliage of the *Crinum moorei* parent is at its very worst at blooming time with dead papery leaf tips and bulb coverings and thus very messy looking. Even at its best the *C. moorei* foliage, being light green, thin textured, broad, spreading and wavy, is not as attractive as the neat, close growing, deep green, narrower, foliage of the hybrid with heavy substance.

This year I am using pollen of the very deep almost wine colored *Crinum* 'Ellen Bosanquet' on the deepest colored forms of *Brunsvigia* x *multiflora* and on the deep colored Cape Belladonna, *Brunsvigia rosea* seedlings obtained as parthenogenetic offspring (the hybrids are not). I think the *Crinodonna corsii* clone 'Fred Howard' is about as good as obtainable in the pure pink color class; so I want to work for the deep colored crinodonnas and the pure white ones, and bicolors.

Some of the pure Cape Belladonna, *Brunsvigia rosea* type seedlings resulting from these hybrid crosses are interesting. The pure white ones are pure thruout, and do not have the apricot throat that their seed parents 'Hathor' and *Brunsvigia multiflora alba* do, and the flowers are small, neat, tailored types, unlike the lovely ruffly flowers of 'Hathor', and are fewer flowered than the *Brunsvigia* x *multiflora alba.* It's an interesting and pretty sight, in the bed of seedlings to see the tips of the spathes poke up out of the ground. The pale green tips always turn out to be white flowers, the pink tipped spathes generally are light pink or rose and the red or deep wine colored tips denote darker flowers and vivid bicolors. Then as they grow, sometimes 3 to 6 inches overnight, the stems repeat the color of the spathes and it's easy to forecast the color of the flowers.

Besides the hybrids with *Crinum,* I have been crossing the white *Brunsvigia* x *multiflora* forms with each other and have also pollinated some of them with pollen of an almost yellow form of 'Hathor' which Charlotte Hoak selected from some 'Hathor' clones at Orpet's nursery

[**BREEDING CRINODONNAS—ANDERSON,** continued on page 81.]

FIRST DECADE OF HEMEROCALLIS WASHINGTONIA

HAMILTON P. TRAUB, *California*

[PART 1, SECTIONS 1, 2 & 3]

The basic chromosome number in the genus *Hemerocallis* is $x=11$. All of the 15 species discovered in the wild have a somatic number of $2n=2x=22$ and are thus diploids. The only exceptions are a few *infertile* triploids $2n=3=33$. When self- and/or inter-fertile *colchicine-induced* tetraploids, $2n=4x=44$, were produced in the 1940's (Traub, 1949; 1951; Buck, 1949; Schreiner, 1951), these did not cross with the diploids to produce fertile offspring. With this reproductive *isolating barrier* between the tetraploids and the diploids, it was necessary to consider the former as a distinct species which was named, *Hemerocallis washingtonia* (Traub, 1951). This apparently happens to be the *first named* colchicine-induced plant species on record.

It should be noted that all tetraploid *Hemerocallis* produced later that actually interbreed, or may potentially interbreed, with the evolving species under cultivation, are automatically a part of the species, *Hemerocallis washingtonia*.

It is unique up to the present when one can officiate at the birth of a colchicine-induced perennial plant species and then also report on its development through the first decade of its existence when the population has already reached several thousands of vigorous interbreeding individuals (Fig. 8). It is planned to publish such a report for each succeeding decade for an indefinite period.

The writer's first report on tetraploid *Hemerocallis* appeared a decade ago (Traub, 1949). Additional notes on *Hemerocallis washingtonia* were reported a little later (Traub, 1951). The present report is a brief summary of the 1949—1959 breeding results, particularly those obtained by the writer from 1952 through 1958 which have not been reported heretofore.

Important contributions in this field have also been made by Robert Schreiner, of Salem, Oregon, and W. Quinn Buck, of Arcadia, Calif., who also started their work in the 1940's. The contributions of these workers will first be briefly reviewed before presenting those of the writer.

Tetraploids of Robert Schreiner.—In a private communication dated Dec. 10, 1958, Mr. Schreiner states that he started his project for inducing polyploidy in *Hemerocallis* in the 1940's. He writes as follows: "I did treat quite a few small *Hemerocallis* seedlings . . . and the results were to me of interest but not of too much concrete accomplishment. Out of these treated plants we flowered in 1947 several tetraploid clones that were pure tetraploids and not chimera type plants with mixed, $2n=44$ and $2n=22$ tissue. One of these I thought was fairly distinct so we named this clone 'Brilliant Glow', and we offered this in our daylily catalog in 1951. This is the year of introduction. It seems to me that there was an extremely high incidence of sterility in these new drug-induced polyploids . . . and so I cast about trying to inter-cross them with the few other tetraploid clones I had. I obtained a few seeds but the few plants I did succeed in raising were not of any great appeal or value as garden plants. I did keep one clone that I still grow which was obtained from a cross of a polyploidized red seedling of 'Autumn Red' (Nesmith, 1941) with 'Brilliant Glow'. This original tetroploid plant I lost in the shuffle of moving from Minnesota to Oregon. The seedling I still grow and use a bit experimentally is not a free seed setter.'' Mr. Schreiner also states that three or four years ago he obtained a plant of the tetraploid, 'Tetra Starzynski' (Traub, 1949), the type of *Hemerocallis washingtonia,* which he used in crossing with 'Brilliant Glow' (Schreiner, 1951) and also with his own red seedling tetraploid. He explains that ''I have a few seedlings of these two crosses that I saved primarily because they are tetroploids and not so much for their own garden value.''

Having an early start, Mr. Schreiner will undoubtedly be able to make further valuable contributions towards the development of the tetraploid daylilies in the coming years.

Tetraploids of W. Quinn Buck.—The writer knows from personal experience that W. Quinn Buck, of Arcadia, Calif., has made important contributions toward the development of the tetraploid daylilies. In his first report (Buck, 1949), he mentioned the colchicine-induced tetraploids of 'Soudan' (Stout, 1932) and 'Kanapaha' (Watkins, 1941), which were later named 'Tetra Soudan' (Buck, 1959) and 'Tetra Kanapaha' (Buck, 1959), respectively. Since that date he has produced other colchicine-induced tetraploids, including 'Tetra Blossom' (Buck, 1959), a very large light yellow; 'Tetra Aurantorosea' (Buck, 1959), dark orange salmon; 'Tetra Arcadia' (Buck, 1959), maize butterfly, late; 'Tetra Prima Donna' (Buck, 1959), a pastel polychrome; 'Tetra Krishna' (Buck, 1959), ox-blood red over orange ground; 'Tetra Red Bird' (Buck, 1959), bright red; and 'Tetra High Noon' (Buck, 1959), a fine yellow. Through exchanges he has obtained 'Tetra Starzynski' (Traub, 1951), a bronzy-rose; 'Tetra Apricot' (Traub, 1951), a clear apricot; and 'Tetra Yandre' (Traub, 1959), light brownish-red, with very wide tepalsegs, wide open.

All of these he is using in his many crosses, and he now has a very large number of tetraploid hybrids from which to select high quality clones for naming. His named hybrid tetraploids include 'Ralph Cornell' (Buck, 1959) and 'Sue Booth' (Buck, 1959). Others are in the evaluation stage and will be named in the near future.

Mr. Buck has encountered some sterility in his breeding work with tetraploids, but is making progress toward eliminating this as far as possible. Thus still other outstanding contributions in the field of tetraploid daylilies will be forthcoming from Mr. Buck in the coming years.

Tetraploids of Hamilton P. Traub.—The following is a brief summary of the breeding work carried on with tetraploids up to the present time. A more detailed report will be made later on.

The initial experiments up to 1951 for the induction of *Hemerocallis* tetroploids have been reported previously (Traub, 1949, 1951). From

1952 to 1954, the work was carried on at Arcadia, Calif., on a sandy soil, and in a region subject to occasional light winter frosts; and since

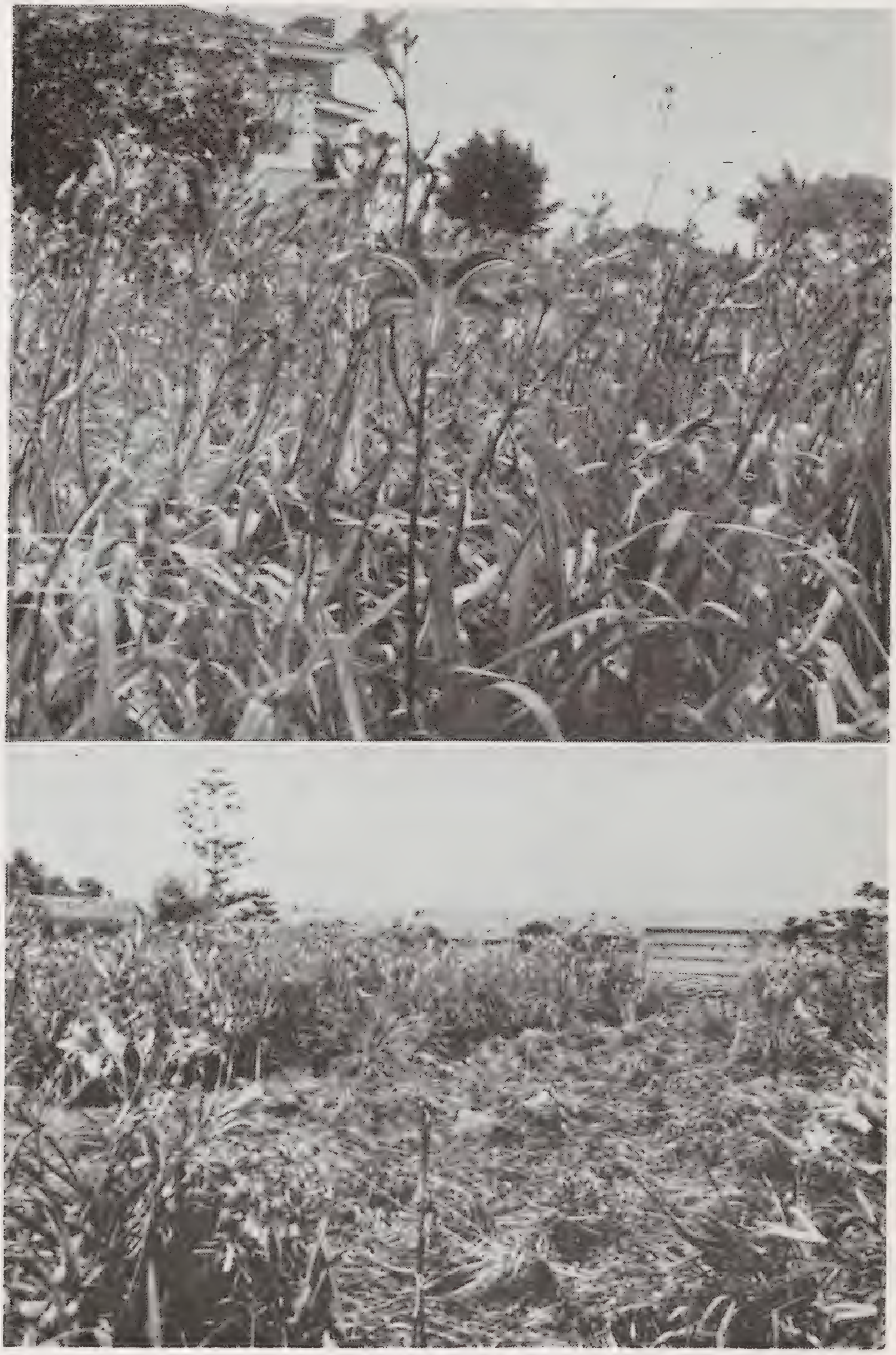

Fig. 8. Upper, block of *Hemerocallis washingtonia,* tetraploids, 2n=44, at La Jolla, California. Note very large flower in center foreground, and several flower scapes in background more than 6 feet tall.

Lower, showing block of several thousand tetraploids destroyed, and another block in near background. Note Pacific Ocean in far background.

the fall of 1954, the experiments have been pursued at La Jolla, Calif., on a clay soil, in a frost-free location on the Pacific Ocean. Typical scenes are shown in Fig. 8.

The summary of the writer's experiments include the following sections: (1) colchicine-induced tetraploid parents; (2) pollen storage, pollination & hybrid tetraploids; (3) selfing tetraploids; (4) obtaining triploids by crossing tetraploids with diploids; (5) artificial and natural selection; (6) cultural methods, including collection and sprouting of seeds, transplanting of seedlings to field; and (7) the evaluation of tetraploid seedlings for garden value. Part of the results, through the third section, will be included in the present 1959 issue; the remaining sections will be concluded in the AMARYLLIS YEAR BOOK issue of 1960 PLANT LIFE.

1. COLCHICINE-INDUCED TETRAPLOID PARENTS

The first step in the breeding of tetraploids consists necessarily of choosing the kind of diploids, $2n=22$, that are to be changed into tetraploids, $2n=44$, by treatment with colchicine.

The diploids were chosen so as to include the various characteristics desired in the tetraploids—*deciduous* clones for the North, *evergreen* clones for the South and to a lesser extent for the North since many evergreen clones can be grown in the North; vigorous plant with many flowers per scape; desirable flower shape and color, and so on. The clones chosen were of two kinds with reference to the chromosome complement—(a) Diploid plants close to the wild species with a relatively homozygous chromosome complement (see Traub, 1958), which are usually self-sterile when tetraploidized, but may some times be cross-fertile; these are known as *autotetraploids.* (b) Diploid hybrids with relatively heterozygous chromosome complements (see Traub, 1958), which are usually self- and cross-fertile when tetraploidized; but there are notable exceptions. This class is known as *allotetraploids.*

AUTOTETRAPLOIDS.—The late A. B. Stout obtained seeds of *Hemerocallis lilioasphodelus* var. *rosea* (Stout) Traub * from the wild in China in the 1930's. From these seedlings he selected the clone 'Rosalind' (Stout, 1941) for its pastel pink flowers (see Fig. 9). It was selected for the present program for the same pastel pink flowers. When this clone was treated with colchicine, contrary to expectancy, the tetraploid form proved to be self-fertile, and seeds were set to self-pollination, and the seeds germinated. Unfortunately, the original colchicine-induced tetraploid had *very brittle* foliage and was lost in culture, but the seedlings survived. They also have *brittle* foliage but to a *lesser* degree, and are difficult to grow. In the greenhouse the foliage is more brittle than when the plants are grown outdoors. The flowers are a deep pastel pink in all cases. One was named 'Tetra Rosalind' (Traub, 1953); see Fig. 9. The rest of the series are known as 'Tetra Rosalind' sibs. It has been almost impossible to set seeds by self- or cross-pollination among the sibs, but when the pollen is applied to other tetraploids abundant seeds are usually obtained. Thus these are very valuable in transmitting the genes for pastel pink to the other tetraploids. The progeny from such crosses do not have the brittle foliage, and the plants show marked hybrid vigor.

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* **Hemerocallis lilioasphodelus** var. **rosea** (Stout) Traub, comb. nov. (syn.—**H. fulva** var. **rosea** Stout, Addisonia 15: pl. 484. 1930.

It should be noted that in this case the polyploidizing of a plant close to the wild *Hemerocallis* species with a relatively homozygous chromosome complement appears to be a very drastic step biologically, and the tetraploids may not be an immediate biological success. It should be noted that even under special care, the original tetraploid was lost, and only the seedling selfs from it have survived and then also only under special care. It is doubtful if such plants could survive in the wild unaided by man in the struggle for existence. This leads one to suspect that if such tetraploids did actually arise in nature over long periods of time, they would most likely have been lost. Such mortality among naturally occurring polyploids would account for the absence of

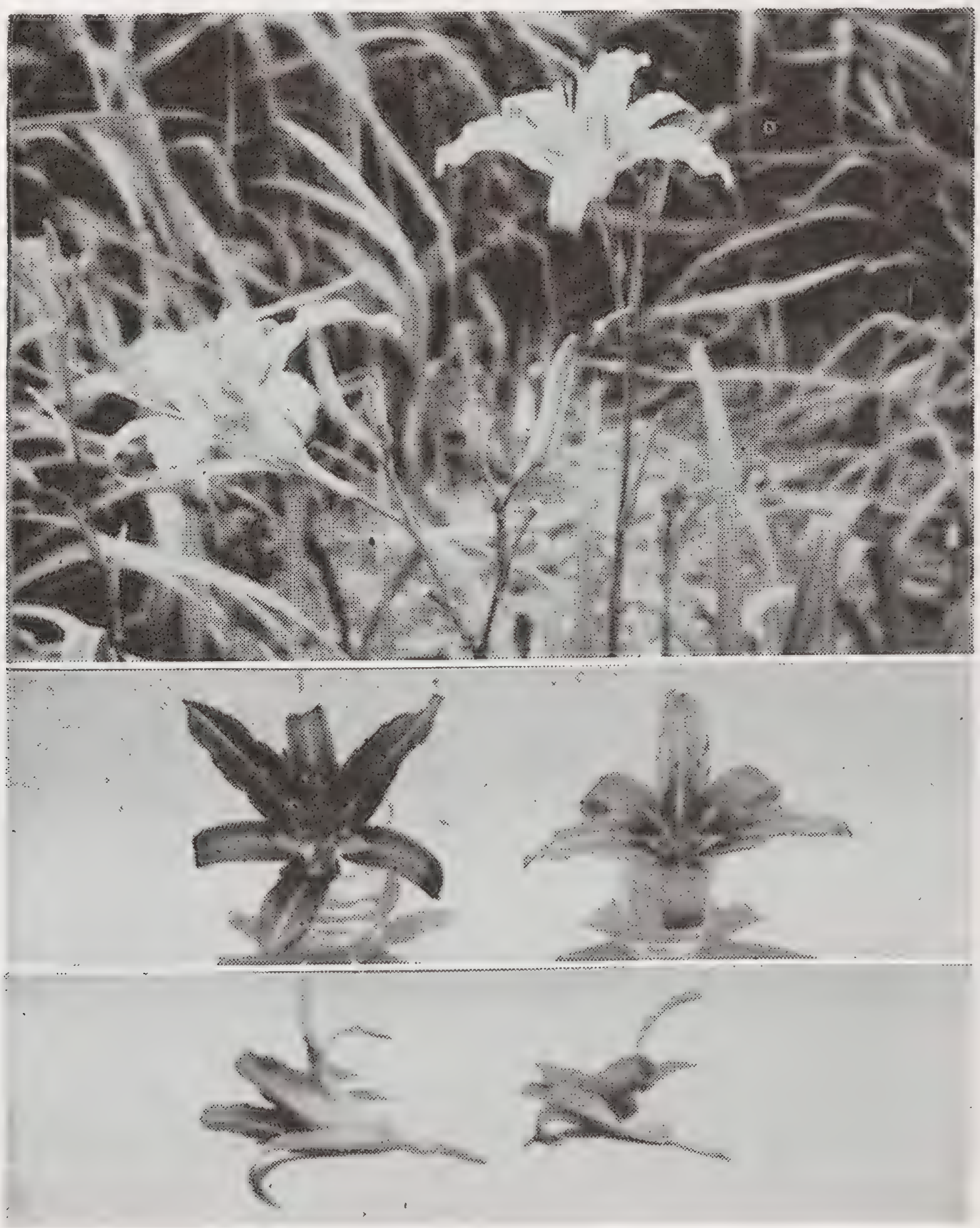

Fig. 9. Right, from top to bottom: *Hemerocallis lilioasphodelus* var. *rosea,* diploid (2n=22) clone 'Rosalind' (Stout, 1941). Left, from top to bottom: *Hemerocallis washingtonia,* tetraploid (2n=44), clone 'Tetra Rosalind' (Traub, 1953).

tetraploids among the *Hemerocallis* species collected in the wild. However, under culture, the colchicine-induced tetraploid was protected long enough so that crosses with other tetraploids could be made and thus the genes for pastel pink flowers were preserved on the tetraploid breeding level. The numerous hybrids obtained by crossing it with other tetraploids show marked hybrid vigor and produce abundant seeds.

ALLOTETRAPLOIDS.—With a few exceptions, the named diploid *Hemerocallis* clones are the result of many generations of cross-breeding so that these hybrids apparently have heterozygous chromosome complements and do not come true from seeds. When these hybrids are treated with colchicine, the allotetraploids obtained are usually more or less self- and cross-fertile, but there are notable exceptions.

Some of the typical hybrid diploids selected for polyploidizing will be briefly mentioned. 'Mayor Starzynski' (Traub, 1939) was selected for its ideal plant habit, with well-branched, many-flowered scapes, and recurrent blooming. This gave 'Tetra Starzynski' (Traub, 1951), the type of the tetraploid colchicine-induced species, *Hemeracallis washingtonia.* The diploid clone 'Elaine' (Traub, 1938) has large light pastel pink flowers, and it gave rise to 'Tetra Elaine' (Traub, 1953) which was unfortunately lost in culture. However, before it died, a cross with 'Tetra Yandre' (Traub, 1959) was obtained which was named 'Tetra Elyandre' (Traub, 1959); see Fig. 11. Thus the genes for pink pastel flowers were saved for further crossing on the tetraploid level. The diploid 'General MacArthur' (Traub, 1942), with good sized brilliant red flowers, gave rise to 'Tetra MacArthur' (Traub, 1953) which was lost in culture. Again, before it died, a cross with 'Tetra Starzynski' gave 'Tetra Arthustar' (Traub, 1959); see Fig. 10. Thus again the genes of this red clone were preserved for use in further breeding on the tetraploid level.

The diploid 'E. W. Yandre' (Hayward, 1939), a land mark in daylily breeding by Mr. Hayward, with very large, wide-open, almost flat flowers, and extra wide tepalsegs (Fig. 11), gave rise to 'Tetra Yandre' (Traub, 1959), see Fig. 11. This was a biological success in every way.

In a similar manner other diploid clones, treated with colchicine, gave rise to other tetraploids. In addition the writer made exchanges with Mr. W. Quinn Buck and obtained in return, 'Tetra Kanapaha' (Buck, 1959), 'Tetra Blossom' (Buck, 1959), and 'Tetra Soudan' (Buck, 1959), which were used to some extent in the breeding work.

2. POLLEN STORAGE, POLLINATION & HYBRID TETRAPLOIDS

The method of pollen storage has been previously described (Traub, 1936; 1958) and served to make pollen of any desired clone available during the flowering season since all of the clones are recurrent blooming in this location. In this way the breeding program has been markedly speeded up.

Pollinations were made in the morning before 9 o'clock and the crop of seeds set from crosses in the majority of cases was excellent. This is undoubtedly due to the foundation stock used. For instance, in the reds, the breeding work started with 'Tetra Arthustar' (Fig. 10) which set a record for seed production. So many seeds were obtained that it was not possible to find space for all the seedlings on the available land as will be shown under Section 5, below. In connection with pollinations it is worth while to mention that the pigments of some of the reds and brownish-reds are permanent dyes, and the worker should not wear his best clothes when pollinating.

Some of the first generation hybrids have been mentioned in Section 1. These and other crosses will be briefly mentioned here: 'Tetra Yandrelind' (Traub, 1959) ['Tetra Yandre' x Tetra Rosalind'] 'Tetra Arthustar' (Traub, 1959), fig. 10 ['Tetra MacArthur' x 'Tetra Starzynski']; 'Tetra Elyandre' (Traub, 1959), fig. 11 ['Tetra Elaine' x 'Tetra Yandre']; 'Tetra Yandrestar' (Traub, 1959), fig. 11 ['Tetra Yandre' x 'Tetra Starzynski'], and so on.

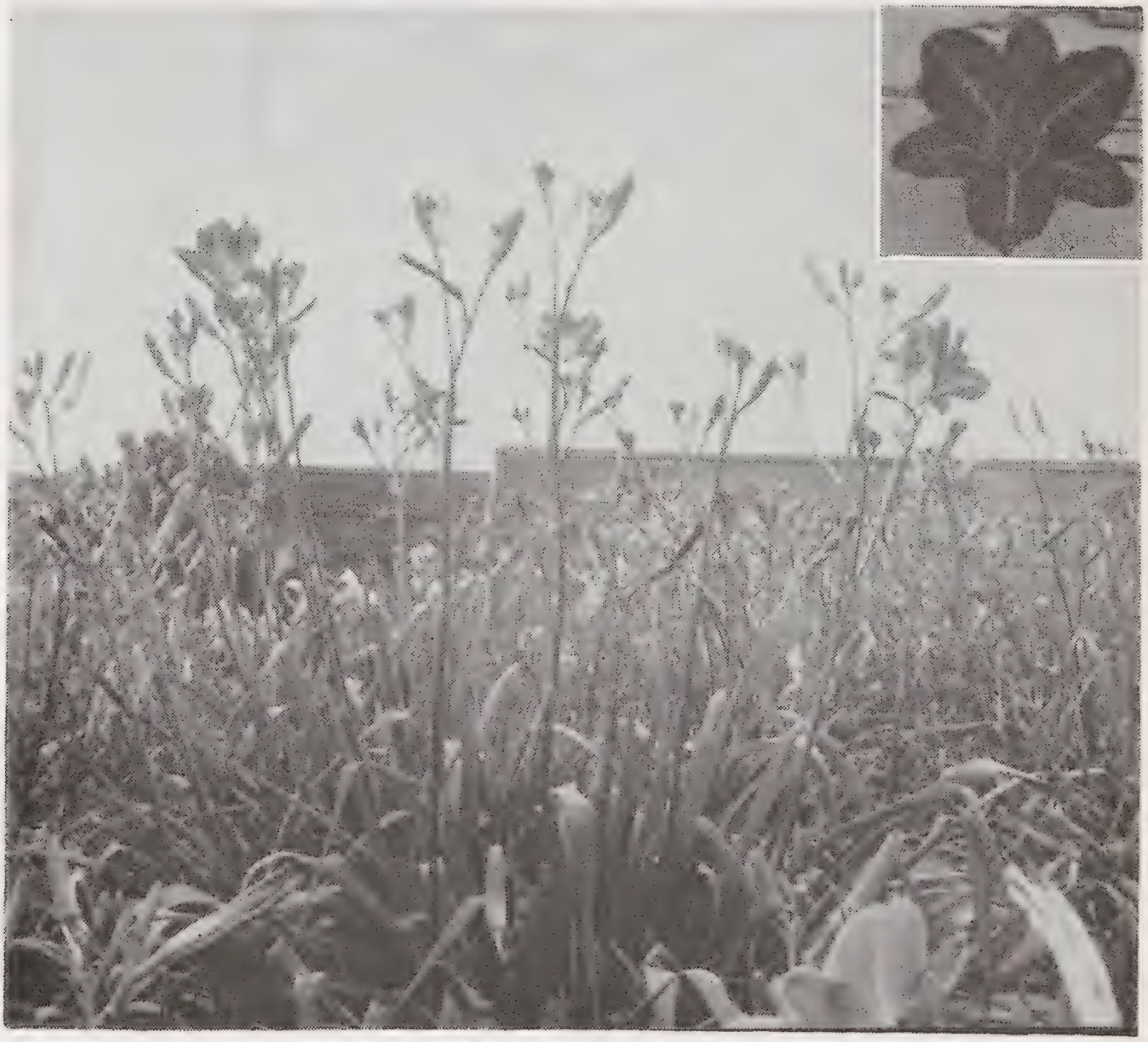

Fig. 10. *Hemerocallis washingtonia* (tetraploid, 2n=44) clone 'Tetra Arthustar' (Traub, 1959), from a cross of 'Tetra MacArthur' (Traub, 1953), and 'Tetra Starzynski' (Traub, 1949). Note the large vigorous clump and the floriferous habit. Upper right inset, individual flower of 'Tetra Arthustar'.

In this way the genes of the original colchicine-induced tetraploids were combined in a first generation progeny. In all cases, the hybrids showed hybrid vigor (see Traub, 1958), that is, the plants were tall growing, with large flowers of thick substance. Apparently most of the *Hemerocallis* breeders do not fully appreciate that the rapid development of the diploid daylilies also has been due in great measure to heterosis or hybrid vigor. This has been defined as the "phenotypic character expression caused by bringing together in the hybrid the dominant favorable genes of both parents."

Each of the first generation hybrids (F_1) was crossed with each of the others. This gave rise to the second generation(F_2). Some back crosses were also made, including pollinating 'Tetra Arthustar' with tetraploid 'Garnet Robe' pollen; and pollinating each of the first generation (F_1) hybrids with 'Tetra Rosalind' pollen. The purpose of this was to increase the proportion of desirable red and pink flower color genes in the vast gene pool.

When this stage is reached and it is necessary to go on to the third and later hybrid generations, it can be easily seen that it would no longer be possible to keep detailed records of parentages unless one has unlimited funds and planting space, and also numerous assistants to keep the records. The objective of keeping records in these breeding experiments has been to obtain data on the inheritance of characteristics in *Hemerocallis,* and this has been attempted within reason by selfing hybrids as indicated in section 3, below. This purpose is wholly different from that of breeding tetraploids for hybrid vigor.

In the main breeding project, the objective is then to make rapid progress toward excellent garden hybrids by means of heterosis or hybrid vigor. The method was adopted long ago (Traub, 1940) of mixing pollens on the basis of flower colors—yellow, orange, pink, carmine, scarlet, crimson, salmon, black, etc.—from the best clones and applying each kind to the best plants having similar colors. This procedure was applied with the tetraploids and resulted in very rapid improvement in the progeny so that even in the third and fourth generations, it was possible to make outstanding selections for garden plants. It would have taken many years longer to reach a comparable stage in the breeding program had the pedantic method of making single crossings been used.

Selections made to date include numerous outstanding clones. Only a few will be listed here. The basis of evaluation will be discussed in section 6, below.

Tetraploid yellows and oranges.—Of the many fine seedlings in this color section (see Fig. 12), only a few have been named so far. 'Magdalena Luethi' (Traub, 1959), lily-shaped flowers of indescribably waxlike empire yellow, delightfully perfumed (Fig. 12). 'Elizabeth Traub' (Traub, 1959), wide-open, immaculate saffron yellow, spicely fragrant. 'Wyndham Hayward' (Traub, 1959), wide-open, almost flat, brilliant tangerine orange with reddish eye-zone (Fig. 3). 'Cabrillo' (Traub, 1959), clear velvety orange, fragrant. And many others not named.

Tetraploid pinks, light reds and salmons.—'Tetra Carmine' (Traub, 1959), fine carmine pink; 'Tetra Rose' (Traub, 1959), clear light rose;

'Tetra Salmon' (Traub, 1959), soft salmon pastel. Others not named.

Tetraploid medium and dark reds.—First among these is the Pacific Series. When one certain red-flowered seed parent was used with pollens from selected red-flowered parents, hundreds of seedlings were obtained that were uniformly large brilliant reds so nearly alike that it was hardly possible to single out clones for naming. Thus it was decided to consider these as a series to be known as the Pacific Series,—'Pacific One', 'Pacific Two', and so on.

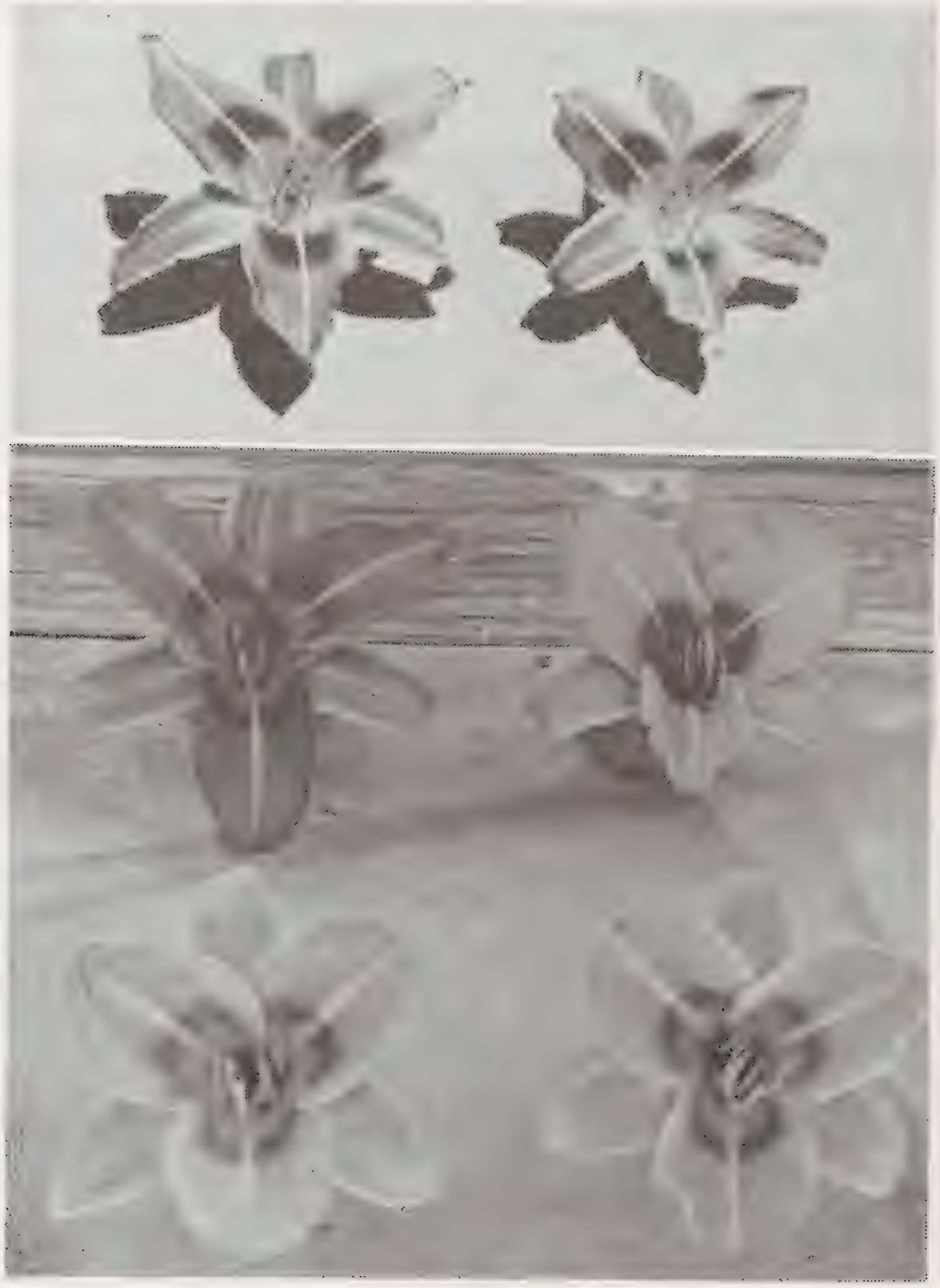

Fig. 11. Top, left to right: *Hemerocallis washingtonia* (tetraploid, 2n=44), clone 'Tetra Yandre' (Traub, 1959), and *Hemerocallis* (diploid, 2n=22) hybrid clone 'E. W. Yandre' (Hayward, 1939).

Center, left to right: *Hemerocallis washingtonia* (tetraploid, 2n=44), clone 'Tetra Elyandre' (Traub, 1959) and sister seedling, unnamed.

Bottom, left to right: *Hermocallis washingtonia* (tetraploid, 2n=44), clone 'Tetra Yandrestar' (Traub, 1959) and sister seedling.

Other outstanding reds include 'Tetra Crimson' (Traub, 1959), near chrysanthemum crimson; 'Tetra Scarlet' (Traub, 1959), bright scarlet;

'Tetra Black' (Traub, 1959), very dark red; 'Copernicus' (Traub, 1959), large bright red; leaves very broad. And many unnamed seedlings.

3. SELFING TETRAPLOIDS

Selfing colchicine-induced tetraploids.—It has already been indicated that by selfing the colchicine-induced autotetraploid of the diploid 'Rosalind' (Stout, 1941), seedlings were obtained, including 'Tetra Rosalind' (Fig. 9) and its sibs, which had foliage less brittle than the original which died in culture. Attempts at further selfing here have been unsuccessful so far, but attempts will be made to obtain seed set by applying hormones after self-pollination.

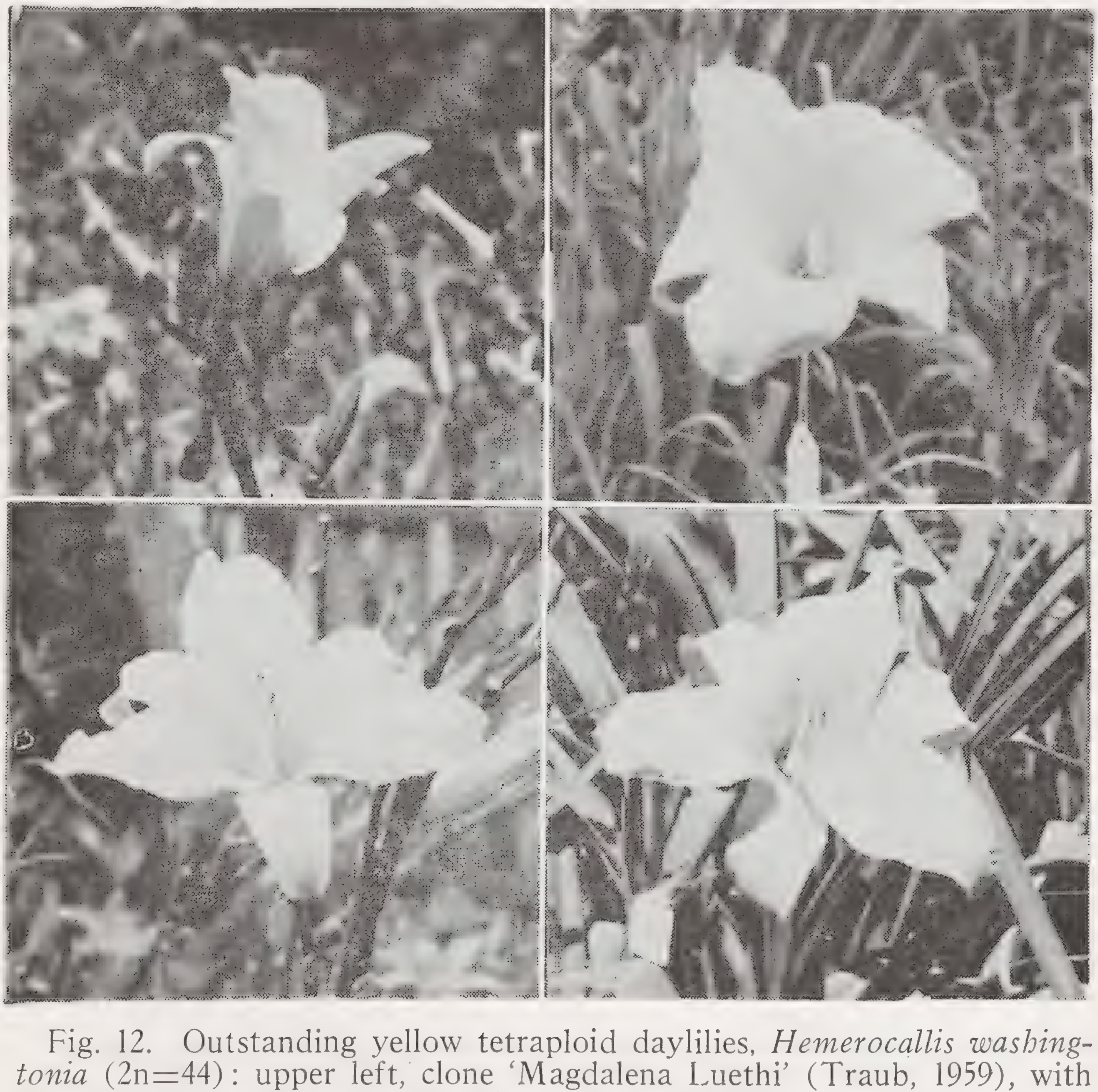

Fig. 12. Outstanding yellow tetraploid daylilies, *Hemerocallis washingtonia* (2n=44): upper left, clone 'Magdalena Luethi' (Traub, 1959), with lily-shaped flower, wax-like empire yellow (HCC-603).

Upper right and lower two: outstanding unnamed tetraploid yellow daylilies with wide open-shaped flowers.

Under allotetraploids above, 'Tetra Starzynski' was mentioned. When this was selfed, many seedlings were obtained which were quite similar in plant and flower shape characteristics. The flower color ranged from apricot yellow, bronzy-rose to reddish. Two of these were named, 'Tetra Apricot' (Traub, 1951), and 'Tetra Peach' (Traub, 1951). In this case there was no reduction in size of plant. Further selfing was somewhat more difficult but the progeny were similar to the parents, and for this reason the project was discontinued since the selfs bred true for all practical purposes.

Also under allotetraploids above, 'Tetra Yandre' was mentioned. This was selfed in order to obtain brighter colored progeny. In this case selfing was facilitated by growing the plants in the greenhouse, and twenty-seven selfs were obtained. These ranged all the way from very dwarf plants to medium sized and some plants that were equal to the parent in vigor. The flower shape was uniform, flat, open-faced as in the parent, but the dwarf plants had somewhat smaller sized-flowers. The flower color ranged from light pastel yellow, to light brownish yellow and brilliant tangerine orange; all had reddish eye-zones. The clone 'Wyndham Hayward' (Traub, 1959), a brilliant tangerine orange (Fig. 3), is one of the selections made. Thus selfing has given some concrete results. Attempts at further selfing of the progeny has failed so far but here again attempts will be made with the aid of hormones.

Selfing after crossing tetraploids.—The first attempt in this category was with 'Tetra Arthustar', described above, which proved quite self-fertile. The selfs were uniformly good reds similar to the parent but were not as good as crosses between this clone and similar reds. The selfing was not carried beyond the first generation because there was not sufficient time and land available to carry on the experiment, but it may be taken up again later.

In another experiment, the selfing is now in the second generation with the objective of obtaining information about the inheritance of characteristics in tetraploid *Hemerocallis.* The cross chosen is 'Tetra Yandrelind' ('Tetra Yandre' x 'Tetra Rosalind'). The first generation selfs have flowered. The second generation selfs have been planted out, but have not flowered as yet. When these bloom the results will be reported in the AMARYLLIS YEAR BOOK.

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[PART 2, SECTIONS 4, 5, 6 & 7 WILL BE INCLUDED IN PLANT LIFE, VOL. 16. 1960.]

[**LYCORIS RADIATA—HAYWARD**, continued from page 146.]

and Japan are known, but the study would be worth while. The bulbs of *Lycoris radiata* and *L. aurea* are found in the lower South where they are really almost native, so well they have become naturalized. They are slightly different in form and character from the same species as grown in Japan for export to United States bulb dealers since World War II.

Lower Florida, below the line of Palatka, seems to be less well adapted to the successful growing of *L. radiata* than the upper part of the state and around the Gulf Coast. However, the largest commercial planting of *Lycoris radiata* so far found in the South is at Green Cove Springs, Florida, which is well up the peninsula on the St. Johns River some 25 miles south of Jacksonville. There they are a minor crop with William J. Leseman, well known gladiolus cut flower grower who has made a specialty of several small bulbs of this kind for the trade for a number of years. Among his special bulb crops have been *Zephyranthes grandiflora* and *Leucojum aestivum* clone 'Gravetye Giant'. He grows or has grown these by the many thousands.

So far as known he is the only dealer in the East supplying commercially graded and carefully grown *L. radiata* bulbs by the thousands. The bulbs can be obtained from farm wives in other southern states by the hundred or bushel, but including large and small, slabs, splits and only a few sound, commercial round bulbs, such as the trade demands.

Mr. Leseman was kind enough to supply the following notes based on his experience growing *Lycoris radiata* for many years.

''I have handled this item for more than 30 years. I find it is not possible for me to predict if any particular bulb will bloom or not in a given year. Without going deeply into planting particulars, which are as usual in the bulb line, I would say that they like to make their own shade, by growing luxurious foliage closely together in clumps or in mass plantings.

''They need plenty of moisture and good drainage when growing. Good drainage is very important. The stock that I am growing came from Holland originally, as I recall, but is similar in every way to the commonly grown Southern form. Probably the Dutch growers imported them from China. I find the main point in their culture is to let the foliage dry off completely and to let the bulb dry off too, if one wants a good bloom.

''I have tried all sorts of land and soil types, rich in humus and otherwise and without any particular benefit to the bulbs one way or another. The best results that I have experienced came when I planted a large quantity of the bulbs in a large lath house or fern shed, covered with white cloth on all sides (muslin) and the top and ends as well. Nearly every bulb made fine growth and a good bloom under those conditions.

''With proper culture and care, which I am not always able to give them, we find them good, hardy, strong bulbs, practically free from

[**LYCORIS RADIATA—HAYWARD**, continued on page 64.]

[**BREEDING CRINODONNAS—ANDERSON,** continued from page 68.]

in Santa Barbara. The resultant seeds from these crosses have been a most interesting study. Some are pure white, some almost a transparent milky white, and some white seeds are completely covered with brown specks. Sometimes some pink and red seeds show up in the pod too, but I figure they have been contaminated by pollen from pink flowers 'sneaked in' by a bee; but I wont know till they bloom. I have segregated all these seed as to color and planted each batch separately. The shape of the seed varies too, some round, some oval and most of them, due to crowding perhaps, are pressed into eight sided cones, the shape being similar to a cut diamond with many facets, coming to a point at the bottom and rounded on top.

At the time of this writing, these whites are just beginning to bloom and are as varied as can be; ruffles and apricot throats, pure whites and tailored whites, creamy colors and some with pink edges, but most of them are yet to bloom in the next few weeks.

AMARYLLIS BREEDING NOTES, 1958

Jack Scavia, *California*

In the past 12 years since the writer started collecting amaryllis there has been a great improvement in the hybrids offered on the market.

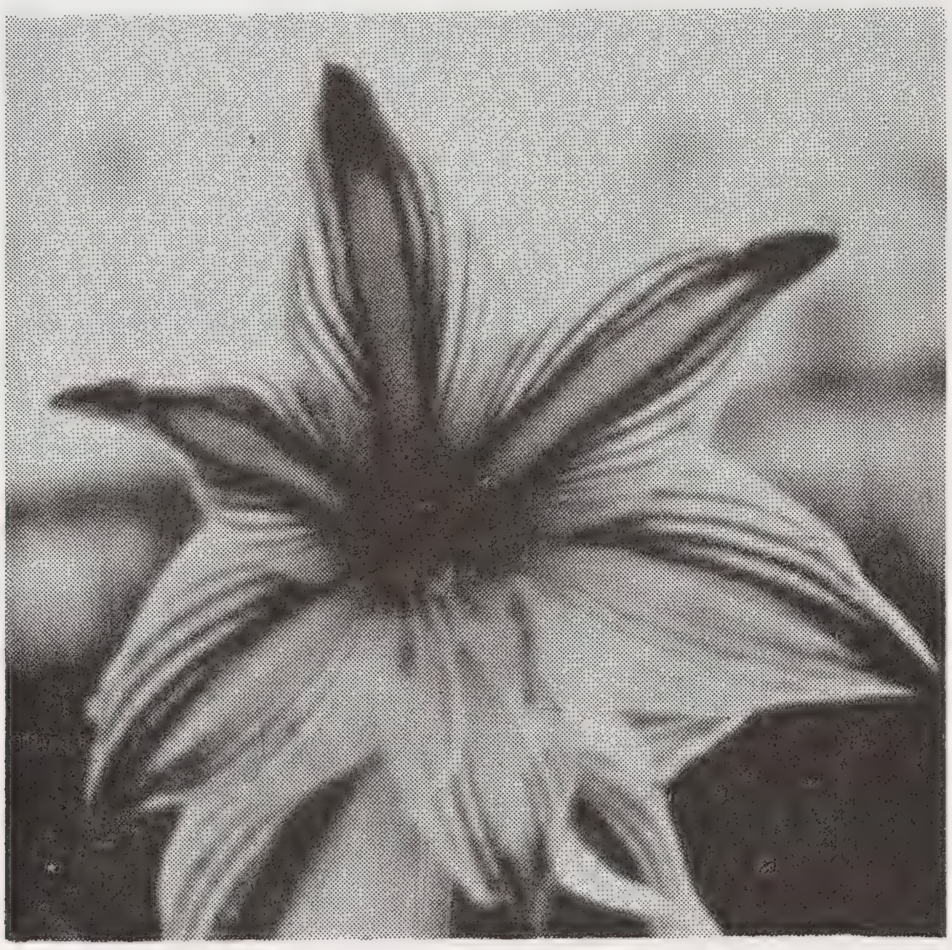

Fig. 13. Hybrid *Amaryllis*—hybrid white clone crossed with *Amaryllis psittacina*—produced by Jack Scavia.

While the Dutch growers, particularly Ludwig, have offered more and better named clones, the general level of seedlings offered is vastly superior to those of the mid 40's. In the writers case, vegetative propagation is practical only when increasing some radically improved form; propagation by seeds from crosses using parents with extreme differences in color, size, form, time of bloom, etc., often produces seedlings with unique characteristics. There are always some seedlings that resemble one parent, some the other and many totally different; many have to be culled out, but usually a few are worth keeping for breeding, or rarely, for vegetative propagation.

Using a near white as the seed parent and the species, *Amaryllis psittacina,* as the pollen parent produced many interesting seedlings, two of which are worth further developing. One has the form of the seed parent, plus vertical stripes and featherings of red (Fig. 13); the other has the form of *A. psittacina* with more white than the species shows.

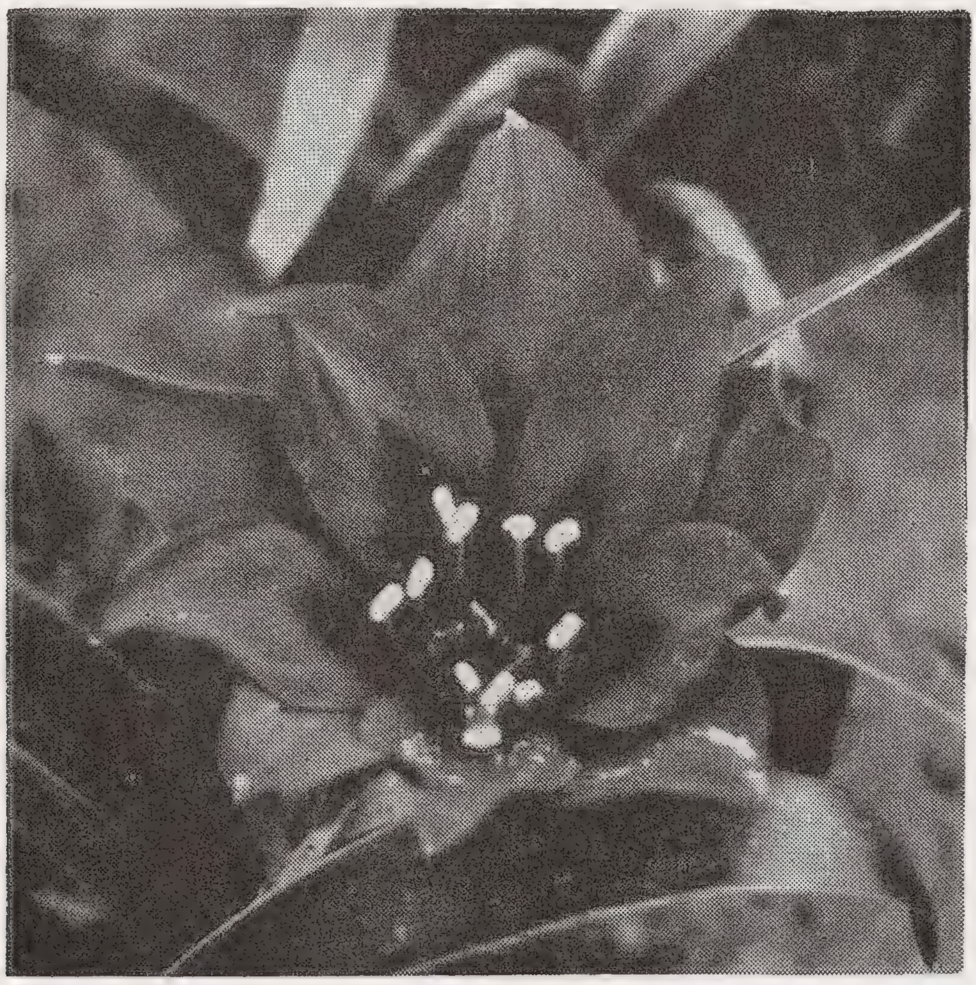

Fig. 14. Hybrid semi-double *Amaryllis*—hybrid double seedling crossed with the clone 'Helen Hull'—produced by Jack Scavia.

Crossing a red (natural mutation) with 10 tepalsegs with pollen from the double clone 'Helen Hull' produced, along with many singles or 6 tepalseg types, a number of multi-tepalseg forms. A few of these are scarlet selfs, with 10 tepalsegs opening flat, five overlapping five, 10 anthers and 1 style (Fig. 14).

One of the most interesting aspects of various forms of doubles amaryllis is the unfixed quality of the flower. Many mutations have one bloom with 8, 10, 12, or 18 tepalsegs while other blooms on the same scape are natural, with only six. In the case of some double forms, the anthers are often part of the tepalsegs, lacking filaments and rarely of the same number; often the stigma is deformed or even absent. Perhaps, when the bulbs produce the same number of anthers as tepalsegs, with a perfect stigma and each bloom on the same peduncle is identical, the cross may be called stable or fixed.

MIXING POLLENS IN AMARYLLIS BREEDING

J. Gurrad Metz, *California*

My interest in Amaryllis breeding dates back approximately sixteen to eighteen years when I acquired a few Mead Reginae strain, *Amaryllis* x *degraaffara,* bulbs. In the following years I increased and improved my collection by additions obtained from Mrs. Sherman's rather fine collection of Diener reds, and Mr. Lemon's collection of seedlings of good form, mostly variegated colors. The resulting seedlings from cross-pollinating within this collection proved to be average.

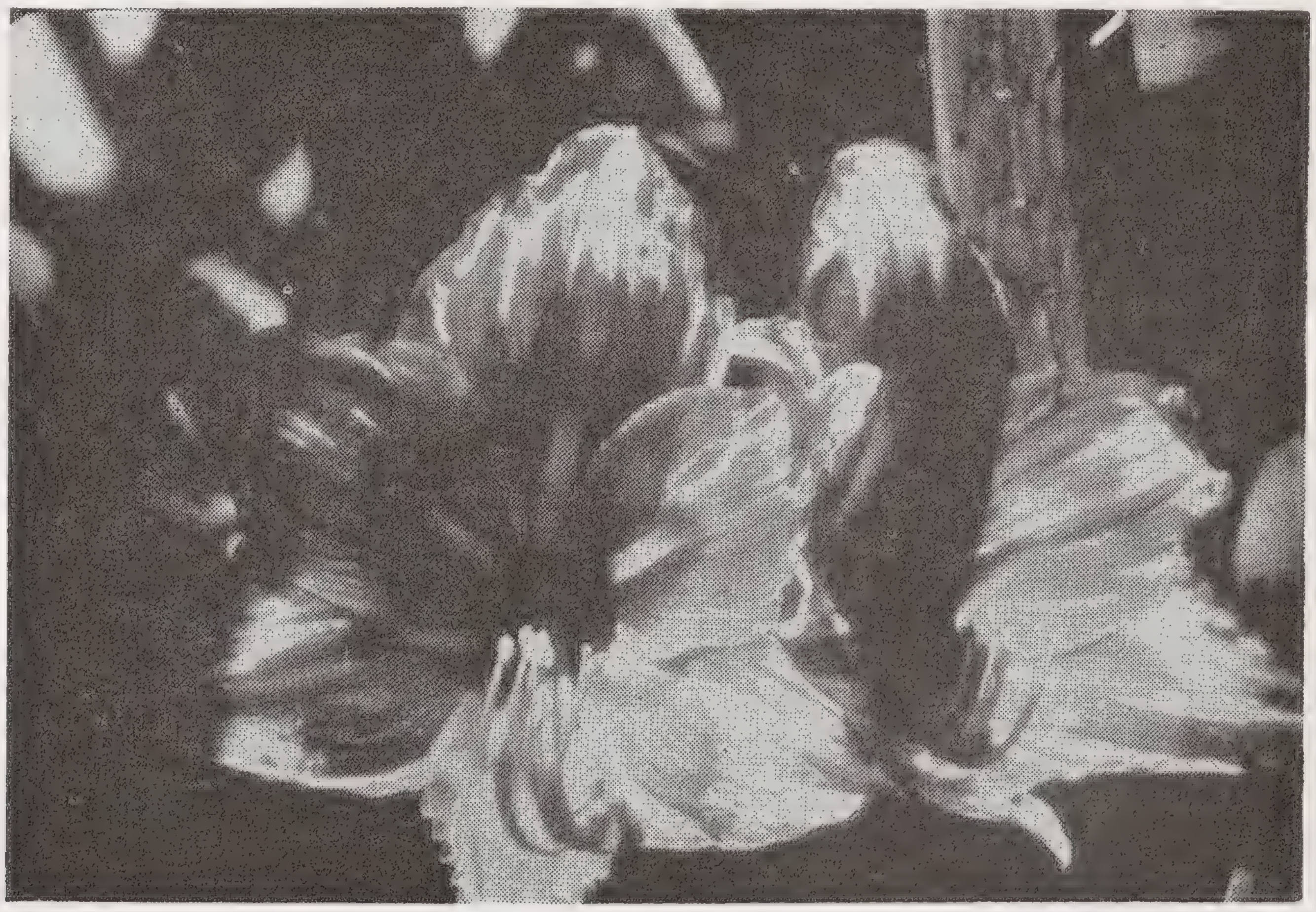

Fig. 15. Hybrid *Amaryllis*—red with irregular white markings obtained by J. Gurrad Metz. Photo by Jack Scavia.

In 1953 I purchased a few bulbs of the Ludwig Leopoldii strain, *Amaryllis x pearceara.* When the bulbs came into bloom, I decided on a new method of pollinating. I selected four bulbs in bloom that were noteworthy in color, form, and so on. The pollen was then removed individually from the flowers of the first three bulbs, and applied likewise, as a single application to each of the three arms (lobes) of the stigma of the four bulbs in bloom. This pattern was repeated until all four blooms had been pollinated. The final result was that twelve crosses instead of the usual four had been made.

I also tried another method. I selected three or four of the most desirable blooms, removed the anthers, and placed them together on a piece of waxed paper. The pollen was then removed from the anthers and mixed thoroughly with a toothpick. This mixed pollen was used to pollinate several different selected clones then in bloom. I found out later that Dr. Traub (1940) had used a similar method in breeding *Hemerocallis.* I resorted to the above methods of pollinating because the usual method of making single crosses is altogether too slow. I feel that not only time is saved in using the new methods but also greater opportunity is presented for obtaining the greatest possible number of recombinations of color, form, and so on.

The illustration (Fig. 15) shows one of the worth while clones that were obtained by the use of these methods. It is a red with irregular white markings.

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OPTIMUM ROENTGEN (X-RAY) DOSAGE FOR HEMEROCALLIS SEEDS (ABSTRACT)

Mr. Graf Shults of Baltimore, Maryland, an enthusiastic *Hemerocallis* breeder harvested 9,000 plus *Hemerocallis* seeds from his choice hybrid stock in 1957. At Johns Hopkins University, Baltimore, Maryland, these were weighed out into units of 20 grams each and exposed to varying dosages of X-rays through the courtesy of Dr. Carl P. Swanson and Dr. William H. Kammer in order to determine the optimum roentgen (X-ray) exposure for maximum potential mutations in the living material. The unit of exposure was as follows: (a) the voltage applied was 250,000; (b) the intensity was 20 milliamperes; (c) the dose rate was 21.3 R/sec.; and (d) the filter used was 1 millimeter aluminum. The roentgens (X-rays) applied to the 11 lots ranged from 500 to 5,000 roentgens as indicated in the following table:—

Lots	Number seeds	Roentgens	Seeds germinating	per cent germination
1 (control)	850	No exposure	180	21.17*
2	850	500	175	20.58
3	850	1,000	130	15.29
4	850	1,500	128	15.05
5	850	2,000	93	10.94
6	850	2,500	73	8.58
7	850	3,000	63	7.41
8	850	3,500	50	5.88
9	850	4,000	44	5.18
10	850	4,500	40	4.70
11	850	5,000	12	1.41

* 90 per cent germination is not unusual if planted in fall or immediately after harvesting.

The treated seeds were planted by Graf Shults on June 15, 1958 on wet newspaper covered with peat; the peat was covered with white sand, and the beds were protected with wire-screen. The counts were made on Sept. 2, 1958.

On the basis of this experiment, it is suggested that the optimum X-ray dosages for maximum potential mutations in *Hemerocallis* seeds are 3,000, 4,000 and 5,000 roentgens.

ZEPHYRANTHES RUTHIAE CLONE 'RUTH PAGE'

THAD M. HOWARD, M.D., *Texas*

This hybrid clone was the product of a series of crosses involving *Zephyranthes citrina* and *Z. rosea* made in the summer of 1952, in hopes of creating an intermediate orange-flowered *Zephyranthes* hybrid. Hybridity was evident in some of the seedlings from the beginning, and these flowered two years later, in 1954. Although the elusive orange flowers did not materialize, it was apparent that two distinct rose-flowered hybrids from these crosses had considerable merit. The best hybrid of the two was christened 'Ruth Page' (Fig. 16) in honor of a former school teacher of mine and was Registered in 1958 HERBERTIA. The second hybrid was named 'Eubank'. The remaining seedlings were maternal forms of *Z. rosea* and did not flower until several seasons later.

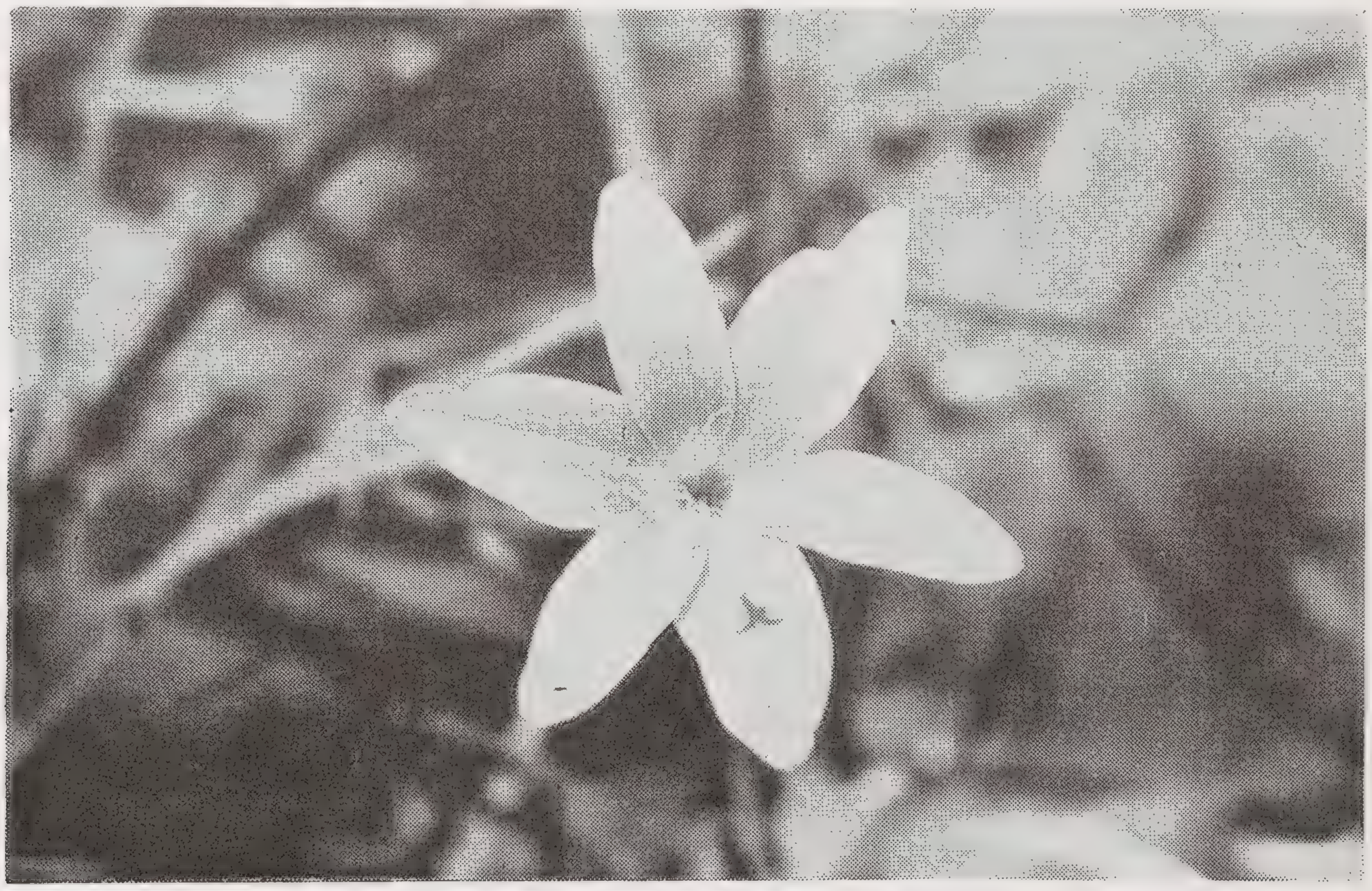


Fig. 16. *Zephyranthes* x *ruthiae* clone 'Ruth Page'.

'Ruth Page'—This is a new *Zephyranthes* hybrid clone resulting from crossing *Z. citrina* ♂ x *Z. rosea* ♀. An extremely vigorous clone, it shares many characteristics with its seed parent, *rosea,* but is half again as large in its floral parts, and the foliage is more upright. It bears no resemblance to *citrina,* its pollen parent. The flower is rose-pink with a white throat. The smoothly textured segments are faintly veined with darker rose lines, creating a curious "checkered" effect. The thin flat foliage is dark glossy green, reddish tinged at the base, and upright. The flower is characterized by a long slender declining style and prominently trifid stigma. The pedicel is 1¼ to 1½ inches long, and the green tube is ½″ long. The flower itself is 2½-3 inches across the face, and very graceful. Mature bulbs are nearly an inch in diameter. Offsets are freely formed.

Although the writer made many attempts at crossing the yellow *citrina* with the pink *rosea,* the first results were failures. It was found that seedlings from *citrina* produced only maternal forms. It was more difficult to get *rosea* to set seed, and when it did set seed, the seeds were produced in scant numbers with only a small percentage of the seed being viable. Many of the seedlings lacked vigor and did not survive, but it was apparent that two of them had hybrid vigor. It would seem that nature had made *Z. rosea* very miserly with her seed, and had placed many obstacles in the path of the hybridizer.

Of the two hybrids, one had foliage similar to *rosea* in color, while the second had darker foliage tinged red at the base and made numerous offsets. A year later it had a sizeable family, and by the time it bloomed there were ten offsets present! The first bud of this new hybrid was watched with much interest and high hopes, but the hopes quickly vanished when, instead of the sought-for orange color, the developing bud assumed a deep rose-red hue, typical of *Z. rosea.* Nevertheless, the opening was anxiously awaited. A grasshopper had been anxious too, for the flower was found toppled that morning, with the large insect greedily munching on the stem. The grasshopper was immediately killed, and the flower placed in water to complete its development. It was noted that the flower was intermediate in size between *rosea* and *grandiflora* but more graceful and smoother in texture than either, but it was not until the following year when the mother bulb and many of the offsets flowered in the garden that I realized its true merit. It set seeds, though not necessarily in any abundance, both when selfed and when pollinated by other species. It was obvious that this was a hybrid not only good in its own right, but one that might serve as the basis for many other new hybrid generations. Later results proved this assumption to be correct. By using various species as pollen parents, I have succeeded in achieving my goal—an orange hybrid. In addition, I have obtained shades of pink, rose, salmon, and apricot, from the seedlings of 'Ruth Page'. By contrast, the sibling 'Eubank' has increased at a painfully slow pace. Though as large as 'Ruth Page', it is of a paler hue with a prominent green throat and of slightly different form. It too seeds freely.

Perhaps a word may be said for the ''maternal'' siblings that were produced alongside 'Ruth Page' and 'Eubank'. They did not flower until five years later, and when they did, they proved a puzzlement. They are much smaller in all parts than the common forms of *rosea,* with deeper colored, more pointed segments. What is more, they rarely produce flowers with the normal number of segments, most of them having several extra segments. Perhaps they are hybrids themselves or perhaps they are only variants that one might expect to find among *Z. rosea* as found in their native habitat.

BACKHOUSE RED TRUMPET NARCISSUS

W. O. Backhouse, son of the well known Mrs. R. O. Backhouse of pink daffodil fame, submits this photo (Fig. 17) of his special strain of red-trumpet daffodils. The color is HCC 15/1 or 16/1; fire red or poppy red.

He has been breeding to obtain red cups for some thirty-five years, employing the red eye of poeticus material and gradually working it into semi-trumpets and then trumpets. Poor trumpet shape and other undesirable features as well as the recessiveness of the red color gene has made his project a difficult one. However he had one advantage over most breeders, he was a plant breeder by profession and did much toward improving Argentine wheats and other South American agricultural products. During the last few years he was associated with a large fruit corporation down in the Patagonia area, but the unsettled conditions in the country finally caused him to return to England.

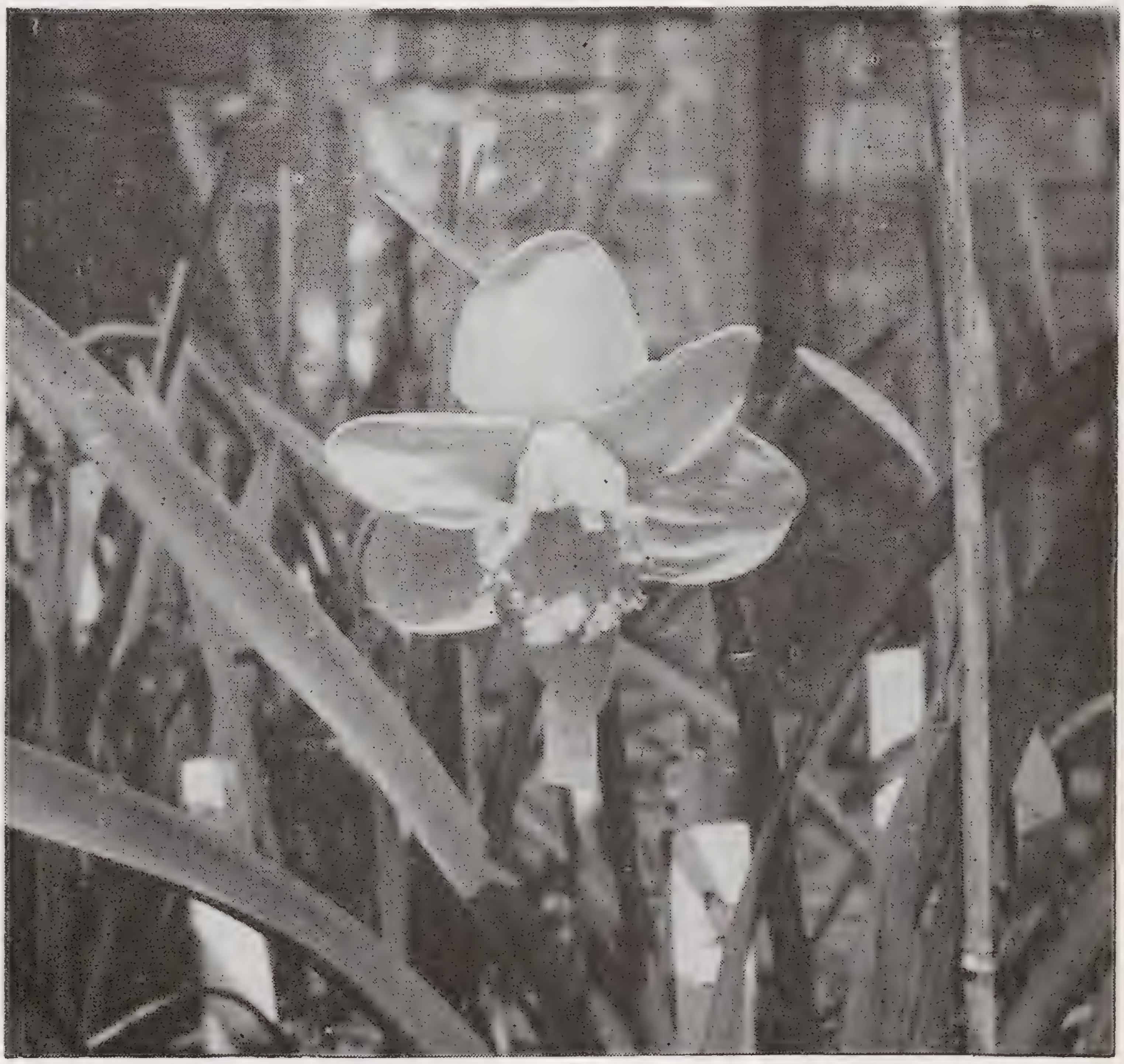


Fig. 17. Hybrid Narcissus—red-cup clone originated by W. O. Backhouse in England.

The trumpets of his recent red daffodils have finally improved in form, and the example is really show material with a good deep yellow perianth except for one disappointing feature, a relative short scape. Never-the-less this is a real achievement and Mr. Backhouse is to be sincerely complimented for his efforts.—*L. S. Hannibal.*

[**PLANT LIFE LIBRARY**—continued from page 164.]

struggle for survival between the newcomers and the original species. The author concludes with an exposition of the role of conservation in preserving variety in plant and animal species. Highly recommended.

TIME, LIFE AND MAN, by R. A. Stirton. John Wiley & Sons, 440 4th Ave., New York 16, N. Y. 1959. Pp. 558. Illus. $9.00. This excellent new text on the methods and principles of paleontology by an outstanding authority is designed primarily for an introductory course. The first five chapters deal with general principles. A chapter each is devoted to history of paleontology, and classification. Seventeen chapters are concerned with a chronological presentation of the sequence of life from the Pre-Carbrian to the Pleistocene. Special chapters are devoted to selected subjects such as foramifera and oil, highlights in the evolution of plants, and animals, dinosaurs, ammonites, birds and man. Highly recommended.

PLANT CLASSIFICATION, by Lyman Benson. D. C. Heath & Co., 285 Columbus Av., Boston 16, Mass. 1958. Pp. 688. Illus. $9.75. This stimulating elementary text on the classification of vascular plants by an outstanding authority is designed for college students and the educated public. The flowering plants are considered under the headings of vocabulary for describing plant characters, the process of identification, preparation and preservation of plant specimens, and the basis for classification. The gymnosperms and pteridophytes receive similar treatment. In addition there is a section on the association of species in natural vegetation. Highly recommended.

THE STRATEGY OF THE GENES, by C. H. Waddington. Macmillan Co., 60 5th Av., New York 11, N. Y. 1958. Pp. 262. Illus. $4.00. This stimulating book by an outstanding authority is concerned with the two fundamental problems of theoretical biology,—(a) the nature and organization of biological processes which results in things having definite and characteristic structures, and (b) how evolution brings into existence organisms so well adapted to the requirements of their life. This is required reading for all who are seriously interested in biology, particularly geneticists and students of evolution.

THE SLOANE HERBARIUM, revised & edited by J. E. Dandy. Published by British Museum, London, England. 1958. Pp. 246. Illus. This is an annotated list of the horti sicci comprising the Sloane Herbarium, now at the British Museum, with biographical accounts of the principal contributors together with some information about these specimens; indices to geographical localities and botanical names; and facsimilies of handwriting. It is based on records compiled by the late James Britten, with an introduction by Spencer Savage, and is now revised and edited by J. E. Dandy. The book is not a catalogue of specimens in the Sloane Herbarium but is a guide to its contents. The publication of this book should stimulate renewed interest in this Herbarium which contains various type-specimens, particularly of Linnean species.

PLANT BUYER'S GUIDE, 6th ed., by H. Gleason Mattoon. Massachusetts Hort. Society, Boston, Mass. 1958. Pp. 298. $15.00. This completely revised new edition of the Plant Buyer's Guide brings the subject up-to-date. The expanded guide is now world-wide in scope, and lists double the number of plant sources, with a consequent increase in the number of species included. The book is organized into three main sections: (a) sources of stock, by states and foreign countries; (b) special lists: African Violets, Begonia, etc.; and (c) available plants, alphabetically by genera and species. To keep the guide up-to-date in the future, supplements will be issued periodically. Highly recommended.

NOMENCLATURE OF PLANTS, by H. St. John. Ronald Press Co., 15 East 26th St., New York 10, N. Y. 1958. Pp. 157. $2.50. The author points out that an effective way of training botanical students in nomenclature is by having them take part in the doing of it, and the nomenclature case method has been adopted for this reason. Several hundred actual cases are outlined that may be assigned to students. Highly recommended to students of systematic botany.

[**PLANT LIFE LIBRARY**—continued on page 168.]

4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

EXPERIENCES WITH BRUNSVIGIA ORIENTALIS

MRS. LEONARD SWETS, *Riverside, California*

Being very fond of unusual bulbs and especially amaryllids I ordered seeds of *Brunsvigia orientalis* (L.) Ait. ex Eckl., under the synonym *B. gigantea* Heist. ex Schult. f., from the late Miss Kate Stanford in Stellenbosch, South Africa.

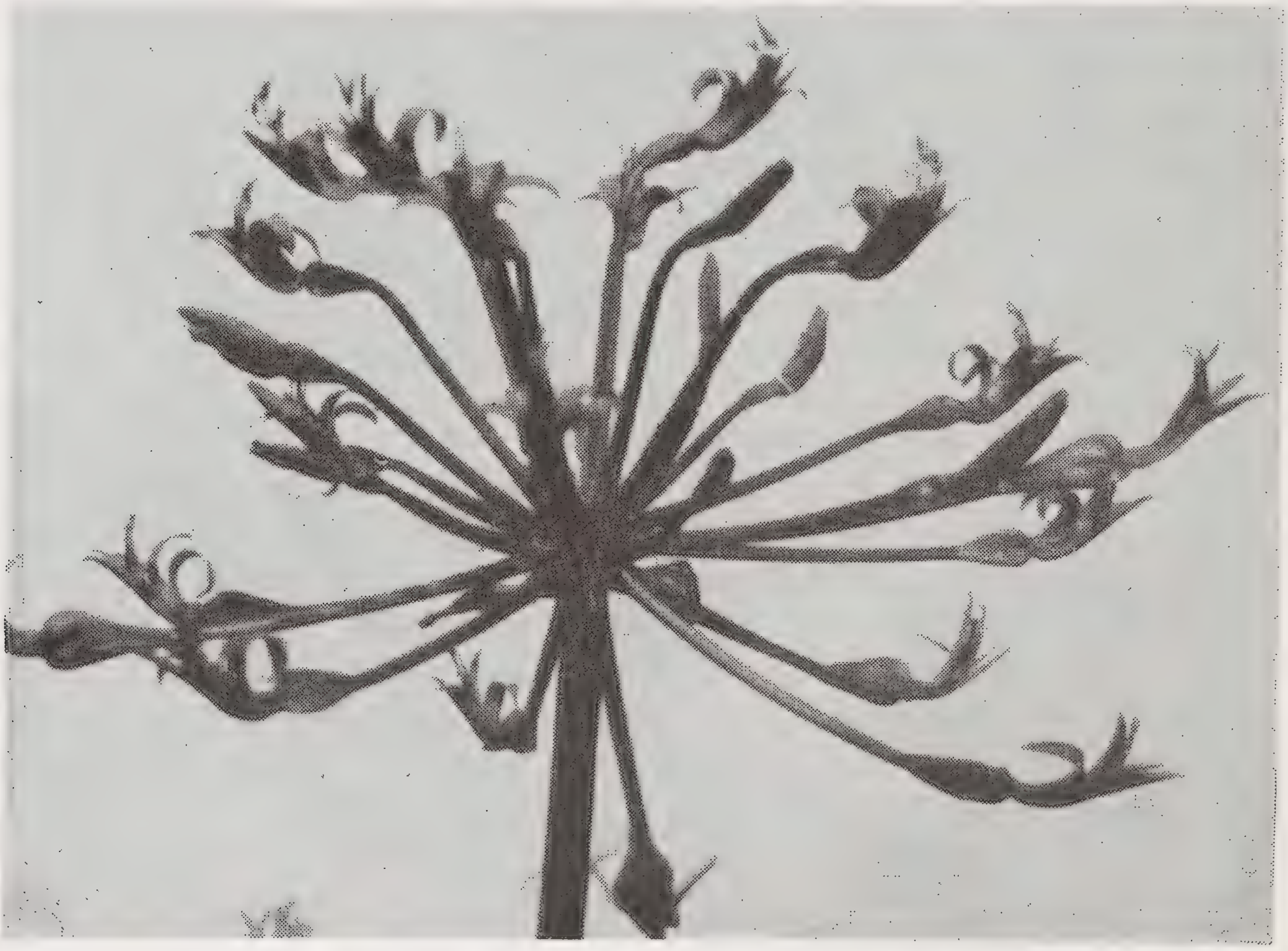


Fig. 18. Flower scape of *Brunsvigia orientalis* (L.) Ait. ex Eckl. as grown at Riverside, Calif., Oct. 7, 1945. Photo by Mrs. Leonard Swets.

On June 27, 1934 I planted them in a flat. They grew very slowly. When the bulblets were about 2 years old, I planted them outdoors. Cool weather did not seem to hurt them as several winters the temperature did go down to 25 degrees. In September 1945 three of the bulbs bloomed for the first time, and they were well worth the long wait. The flowers are spectacular and hard to describe (Fig. 18). Without foliage the stalk rises in a few days to about 20—24 inches in a form of a candelabra, 16 inches or so in width, 20 to 30 flowers in a scape. The color is a lovely coral in the form I have. In a few weeks the whole flower fades to a straw color. When fruits are ripe the whole stalk becomes detached and rolls away if you don't watch.

I have given away many seeds, but so far have not heard of anyone blooming it. The bulbs have not multiplied at all. The leaves are produced after blooming, 4—6 very large, and they lie flat on the ground, somewhat like *Haemanthus coccieus,* but are large and exotic looking. I tried growing a few bulbs in pots but the foliage grew smaller and none of them bloomed. In early spring the plants go dormant. I rest them until the end of August then water deeply. They bloom here in late September or October.

GROWING AMARYLLIDS IN NORTH FLORIDA

Beckwith D. Smith, *Jacksonville, Florida*

The purchase of the John T. Weisner collection of named Dutch and hybrid *Amaryllis* in 1957 by the writer was reported in 1958 Herbertia, page 71. These bulbs were dug in April of 1957, but due to an overgrowth of chickweed and a heavy infestation of slugs the leaves had little chance to survive or develop, and due to a very rainy spring the roots had all rotted off without exception. Therefore, when they were transferred to Jacksonville into a different growing medium, it took all their strength to recuperate and produce new roots and leaves. So, this year, I was unable to do anything with them in the way of further crossing due to their lack of vigor, and it will be another season before any material advance can be made. Very few of the bulbs produced flowers and none were up to par. However, the growing beds were rearranged this year, with a view to affording better growing conditions, particularly with respect to internal drainage. More sand was incorporated and more granulated peat was added to make higher beds, and, of course. sheep manure and bone meal added in moderate amount for a steady diet. I am happy to report that most bulbs have now recovered, and an examination of numerous ones indicate they have set out new root systems; consequently, more leaves are showing. Since the bulbs are almost normally large, averaging three inches wide, I am looking for good blooms during the spring season of March and April, 1959.

In seedlings of my own Dutch hybrid crosses which bloomed this year, two only are outstanding. One is a large orange color with almost luminous green throat, hard to describe. Flower, eight inches wide, petals overlapping, reflexing after the first one or two days to a rather flat, flaring face. The bloom is quite graceful. The other is a seedling of 'Nivalis', selfed, and also presents a large bloom of similar size, brilliantly white and of good form and substance. Neither of these seedlings have been named. It is my opinion that they should be bloomed another season to determine if their character remains stable.

During April, this past spring, I ran into a most odd situation on the fringe of my own neighborhood. Mrs. Smith and I had gone for a drive on one Sunday afternoon, and she called my attention to a growth of near-white Mead *Amaryllis* in the yard of a home several blocks away from our house. Since they were large flowers for the Mead strain, our curiosity was aroused and we stopped and inquired of the owner if he would be agreeable to selling some of them. It developed that he wanted a solid red of Dutch origin, and having blooming bulbs of these, we made a trade, plus a little cash outlay on my part. At any rate, I came away with six big bulbs.

The blooms in this man's garden were varied in their nearness to a pure white, some having a darker pink or red stripe, and some veined with a very light degree of color. The bulbs I obtained were large, as I have said, none of them being less than four inches in diameter, and each had one or two bloom scapes, foliage long and heavy and with vigorous root systems. He had a sandy loam soil in which the bulbs were grown, and he reported he used chicken fertilizer to make them grow.

All bulb plants were immediately potted up in seven inch pots, and within a short period of time began to bloom. Five bloomed out with light stripes, all being good material for pollinating. The sixth bulb took another week to bloom. At first I thought it would be like the other. It put up one scape which showed the characteristic color, and I began to lose interest. However, it produced a second scape, and upon the opening of the four blooms showed partial change. Each bloom was a pure glistening white, with just a touch of light green in the throat. The flower measured a full eight inches and was most startling to observe.

All of the blooms of five of the bulbs were pollinated with pollen from 'Ludwig's Dazzler'. The blooms of the white Mead plants were selfed on two blooms and the other two were also pollinated with pollen from 'Ludwig's Dazzler'. All set seed satisfactorily, the pure white one produced about twenty five seed, and these are now growing in a row in the garden. It remains to be seen what will be developed in the next two or three years.

In later discussion with the gentleman, it was ascertained that he knew utterly nothing about pollinating the flowers, nor of any method of propagation other than, as he said: "they just grew and multiplied naturally". He had been growing this stock of bulbs for several years and stated he had never before observed a plant to produce white blooms without a trace of color. I demonstrated to him the method of pollinating to obtain seed, and he was most grateful.

This change in color was a paradox for me as for many years I had struggled with the problem of trying to develop a pure white Mead through selective interbreeding, with minimum success. A further note on this most interesting plant is that the leaves are much thicker and wider than on the usual Mead plants, the color being a dusty, bluish green of most attractive hue. The circumstances of finding this bulb leads me to wonder if other *Amaryllis* growers have ever encountered a similar situation?

More of my seedlings of Dutch hybrids will come into bloom next spring, and if North Florida does not have a too severe winter, perhaps there will be more to tell and perhaps pictures to be obtained if some of them are worthy of note. We live in hope always. Next year is always going to be a "better bloom year"—so we wait the new spring of 1959 with great expectations.

EXPERIENCES WITH HYBRID AMARYLLIS

Mrs. Fred Tebban, *Illinois*

A couple of years ago I wrote an article for Herbertia in which I told of two experiments I was trying out in amaryllis culture. One was the use of fluorescent lighting to promote growth while wintering the bulbs indoors, and the second was foliar feeding during the summer while the *Amaryllis* were summering outdoors. I thought there might be some who would be interested in the results of these experiments so I will tell you of my conclusions.

The fluorescent lighting has proved a wonderful aid in growing the *Amaryllis* indoors after the dormant period is over and growth begins, in late February or early March. Since our springs are so late here the growing bulbs cannot be placed outdoors until after Decoration Day. This means they must grow indoors for more than three months in most cases. I have placed the fluorescent lights over the plant tables and keep them lighted from twelve to fourteen hours each day. They are about sixteen inches above the tops of the pots so that the leaves will not grow too tall and weak. I do find, however, that this foliage grown under the fluorescent lights must be hardened by being placed first in shady locations before exposed to the direct rays of the sun. This prevents the burning and ruin of the foliage. After a few days they can be placed where the direct rays of the sun fall on the plants although I try to arrange for some afternoon shading all during growth. The operation of the fluorescent lights has proved to be quite inexpensive too, as they are much cheaper to operate than the incandescent type.

As for the foliar feeding program, I have almost entirely discontinued it. In most cases it produced fine, husky foliage, but no more bloom than other methods, and in a few cases did great harm when the fertilizer used drained down among the scales of the bulbs and caused decay. The bulb scales in some bulbs seem to grow more tightly than in others but in the bulbs where the scales would permit the liquid to settle at the base of the leaves, much harm was done so I feel that foliar feeding of amaryllis is not worth the time and effort expended on it.

This year in my fertilization program I have used a new animal compost in my potting soil. This comes from the stockyards and is used in place of stable manure and guaranteed not to burn. I am also using a fish emulsion which I think very good indeed, and have used muriate of potash in solution several times over the summer. I think this solution of muriate of potash has done much to stimulate growth in the bulbs that always are slow to start growth and next year I shall use it earlier and perhaps more often than I have this season.

I was much interested in reading Reg. F. Harradine's article on *Amaryllis forgetii* in the 1957 issue of Herbertia. About five years ago Mrs. Edith Strout sent me a small offset of *Amaryllis forgetii* and told me there were very few of these in the United States. This offset has grown very well and is now a bulb more than two inches in diameter but has never bloomed for me. After reading Mr. Harradine's article I have kept mine "dust dry" since June first, and find that a first leaf tip is now showing above the long neck of the bulb. I shall watch for the sign of a bud tip showing soon for the bulb is certainly larger than many he describes as having bloomed.

Two or three new Dutch Hybrids were added to my collection also, of the Ludwig strain. 'Pinksterflower' was very nice indeed and will long be a favorite of mine. 'Fantasy' proved not much different from 'Candy Cane' and 'Daintiness' not too different in shade from the other Dutch pinks I have. Thus far 'Tristan', Van Meeuwen strain, is my darkest red and very nice in both form and color. I have a few of the Japanese bulbs just appearing on the market and a few from India but these are probably no better than our American hybrids. To date none of these have produced bloom so I am not in a position to evaluate them.

AMARYLLIS STRIATA FORMA FULGIDA

Douglas D. Craft, *Illinois*

In the fall of 1956 the writer received, from Mr. Wyndham Hayward of Florida, two healthy, medium sized bulbs of *Amaryllis striata* forma *fulgida*. Mr. Hayward's instructions were to plant in a "fertile, light leaf mold type, sandy loam" with "good drainage." Mr. Hayward also stipulated that this Amaryllis "wants half to full sunshine." The writer planted these in a soil formula consisting of one part Fertilife (an organic compost sold by the Chicago Stockyards), one part soil containing much leaf mold, one part fine beach sand, one part small round polished river gravel, one third part of charcoal the size of small gravel and one heaping tablespoon of bonemeal. The soil mixture was very sandy and friable in texture.

Both bulbs were planted in the round, wooden tubs supplied by most seed supply houses. A tub selected was nine inches in diameter and eight inches in depth. A two to three inch layer of small cobblerock was used at the bottom of the tub. A layer of small gravel was added. Cut sphagnum moss was then added to encourage more root growth until the tub was half full of drainage material. The remainder of the tub was filled with the soil mixture described above. Bulbs were then set in the soil which was sifted about the slightly spread roots. The bulbs practically rested on top of the soil with perhaps one-quarter inch of the bases of the bulbs buried. They were lightly watered and set in a sunny south window to root and to grow.

After the first blooming in the Spring of 1957, liquid manure the color of dark tea was fed every other week. It is possible that feeding could have been oftener and in lesser strength, but the writer lets the soil dry somewhat between waterings. Too much water has encouraged rot on other *Amaryllis* in the past. Six or more weeks after flowering or when roots are firmly established, a tomato food chemical fertilizer high in phosphorous and potash, 3-12-13 formula, was used interspersed with the liquid manure. This, according to Mr. Kaiser at the Garefield Conservatory, encourages bulb and bud growth necessary for following bloom. A well rounded teaspoon per tub was used at six weeks intervals. This fertilizer was scratched dry into the soil about an inch and one-half from the bulbs and watered well into it. Caution should always be used in the application of any chemically compounded fertilizer as it has been known to cause root and plant injury through burning of the root system. D. D. T. was watered into the soil about three times during the year and plants were sprayed with a 50% Malathion solution at least twice during the year as an insect control and general disinfectant.

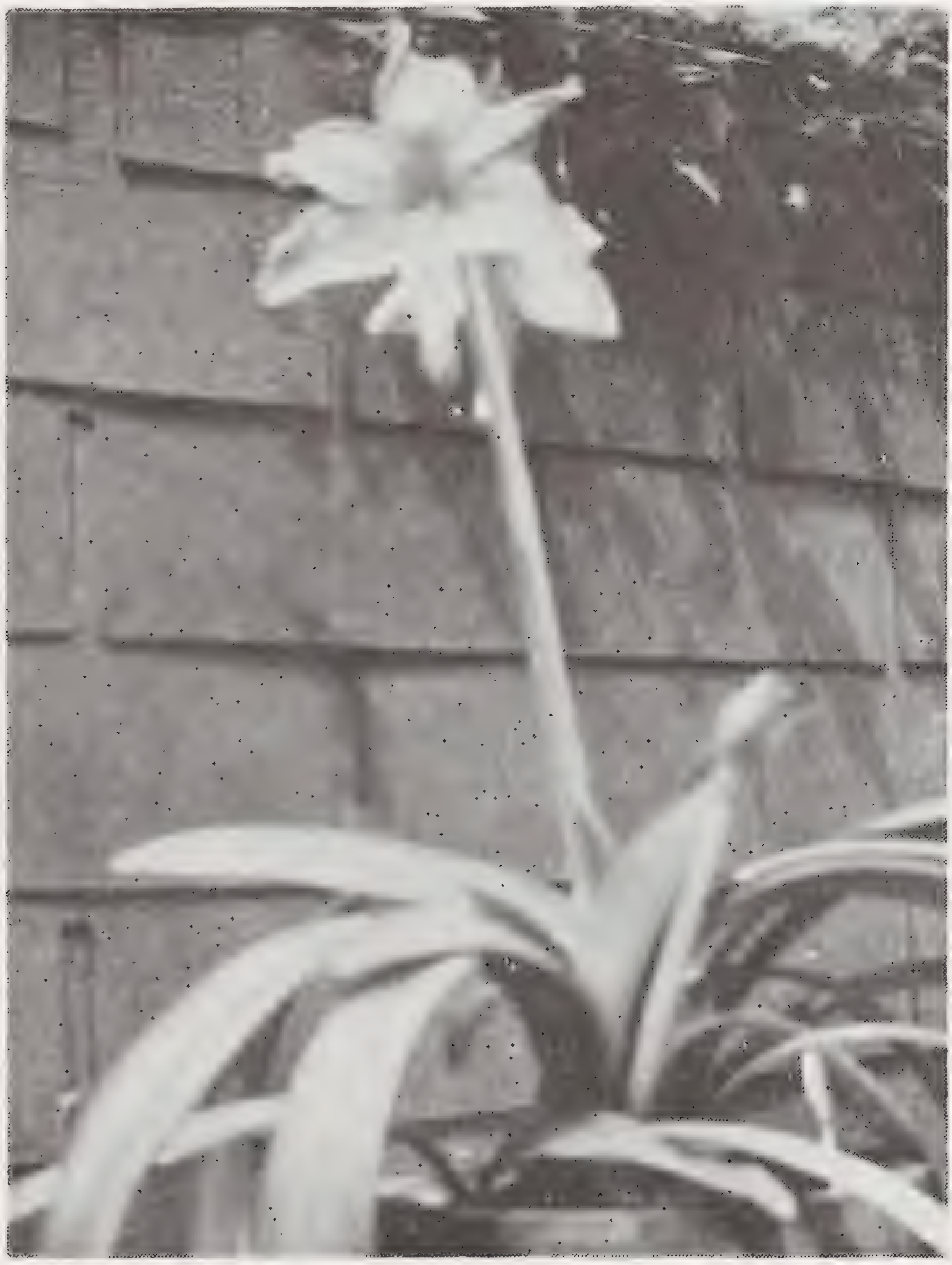


Fig. 19. *Amaryllis striata* forma *fulgida* as grown by Douglas D. Craft in Chicago, Ill.

Amaryllis striata forma *fulgida* (Fig. 19; see also Cover Design) bloomed three times for the writer during the year . . . spring in the house, July on the fire-escape porch, Thanksgiving in the house. It produced three scapes in the spring, two in July, and two at Thanksgiving time. It has not bloomed during the spring of 1958 as yet but in the interim of various blooming, it has produced approximately eight to a dozen young offsets a few of which have been given to interested friends.

In this locality, the summer rains if not too heavy and violent seem to help this beautiful *Amaryllis* to thrive. With the before mentioned care, this *Amaryllis* is recommended to all those interested in Amaryllis and especially those interested in the species. It is especially recommended if you must raise your *Amaryllis* in pots because of climate and space conditions as does the writer. Its bloom is a beautiful shade of pale orange and indeed it is one of the most graceful and flaring flowers in our collection. It should be one of the first species added to a collection whether that collection be of hybrids or species.

It should also be remarked that this *Amaryllis* seems to be one of the evergreen species. From December to the end of February or its dormant stage with the writer, water was given only enough to keep the leaves from shriveling and the roots from drying out. This would average about once a month. The dormant period would seem to vary with its last blooming period.

POSTSCRIPT—"ROOTONE with fungicide", a root hormone put out by the American Chemical Paint Company, Ambler, Pennsylvania, dusted on bulbs at planting time seems to encourage strong root growth.

DAFFODILS FOR SCHOOL CHILDREN

J. S. Cooley, *Maryland*

This past year the Beltsville Garden Club put on a project of giving a bag of mixed *Narcissus* bulbs to each pupil in the elementary school. The bulbs were grown and packaged by two of the members of the Garden Club. The total number required was about 600 packages. Six of the school mothers distributed the bulbs at a stated time during school hours. Each pupil receiving a bag of bulbs was expected to plant them and to exhibit the flowers at a meeting of the Garden Club some time during the next spring.

The display of the flowers at the Garden Club meeting in the following spring attested to the success of the project. The children were highly enthusiastic over the showing made by their flowers.

In this project, the children had a chance to plant, cultivate, fertilize, watch the growth and bloom of their plants in their own little gardens. We are hoping that the interest in plant life thus started may be the beginning of a life long gardening avocation. We commend a daffodil project such as this to garden clubs generally.

AMARYLLIDS IN LANDSCAPE DESIGN

Mrs. A. C. Pickard, *Houston, Texas*

Gardens have varied significance to different people. Privacy, retreat, way to health—all are words often used in defining the need for gardens. For those who are creating living beauty are living life to its fullest.

The American home owner's garden is becoming almost as essential as his dwelling. It is no wonder that a recent survey placed gardening among top American hobbies. As gratifying as it is to see this desirable trend toward horticulture and gardening, there is much evidence that more interest is placed on planting instead of planning; this is the failure to recognize the importance of garden design.

The real challenge in designing a garden is to decide first what is desired or needed. Then, by knowing their best position, character and relation to each other, plant materials may then be worked into the picture. Plant materials in the overall design must have form, scale, texture and color. The coarse texture of broad leaved evergreens, and the finer textured smaller leaved foliage give the much desired airy effect. Contrasting foliage and textures also lend interest to the overall garden design. Seasonal color added for accent of points of interest will complete a pleasing picture for the average gardener.

Most of us dream of a carefree garden. At least one that will not require making over every year. We also want "something different" of a few flowers that are not found in every garden. Into this picture *Amaryllis* and related bulbs can be used. For most gardeners, a reasonable degree of similarity in life expectancy should exist in all of the plants in a given grouping, simply because you do not want to be bothered by replacing deceased members every year or two. Eager spreaders and bashful shrinkers should be avoided in the same partnership. *Amaryllis* bulbs as a class are quite free from these faults. Even the newly developed Dutch hybrids are adequate to a wide variety of climatic conditions and if properly planted will thrive with a minimum amount of care almost indefinitely.

Fascinating colors in flower sizes from dwarf to mammoth are available in the hybrid *Amaryllis*. To achieve the finest in our gardens, much thought should be put on color as well as on design and arrangement. Don't be afraid to mix colors. They are usually separated by green foliage or planted among green foliage plants. The attractiveness of the very dark reds is brought out by planting a grouping of white or light shaded ones near them. Here the companionable variegated foliage plants could soften the effect.

The number of plants to use in grouping depends upon the size of the garden. Too many different kinds make a confused and unsatisfactory composition. The pleasing shades of pink *Amaryllis* fulfill every gardeners desire for magnificient effect. Spot-light the entrance or terrace where they will be enjoyed at very close range. A grouping of the spectacular shades of rose and fuschia-pinks which are available in the named *Amaryllis* clones with an underplanting of white Sweet Alyssum are breathtaking in their beauty. If you already have shrubbery masses you might add a group of the lovely salmon colored *Amaryllis* with a lesser number of whites. Do not forget that while all the colors mentioned may play the part of leading stars in the parade, they need a supporting setting to make the picture complete. White, pink and rose hues are charming when combined with plantings of *Adinatum pedatum* (Maidenhair fern). This fern reaches a height of not more than two feet and the attractive rhythmic designs will fascinate even a casual viewer, especially where the garden is to be enjoyed at night.

Spacing the plants has a great influence on the finished effect and the effect is more finished when kept in scale. By planting some intermediate statured hybrids, as *Amaryllis striata* forms and graceful clones that are small and delicate along the border, a delightful color will flow from one end of the bed to the other. If space allows, you may be gay and lavish in the use of some of the lesser *Amaryllis* relatives—*Rhodophiala, Habranthus, Zephyranthes* and *Lycoris*—to extend the blooming season. Further extending the use of *Amaryllis* is the rather large group that enjoys our semi-tropic climate. They are the varied species of Crinums which lend a note of tropical beauty wherever planted. Their broad strap-shaped foliage is large and handsome and from the base of the strong bulbs, scapes rise three to four feet high with umbels of lily-like blossoms. You may be selective in your choice of color—from white through varying shades of rose, pink and wine. The *Crinum* species and hybrids may be used as specimen landscape material and they are not too exacting as to culture. They do need growing space for their theme song is "Don't Fence Me In". The lovely X *Crinodonna corsii* clone 'Fred Howard' (syn.—*Amarcrinum)*, a bi-generic hybrid of the Cape Belladonna, *Brunsvigia rosea,* is a valuable plant in my garden. It is more of a dwarf plant with large heads of very fragrant clear pink flowers all summer and fall.

Space will not allow mention of many more treasures related to *Amaryllis* that add special interest to the garden. The choice from available plant materials is surprisingly wide. This may be used to add the finishing touches to the garden including permanent borders and ground covering. If you are not already on familiar terms with *Amaryllis* hybrids, including some near relatives, join the ranks and get acquainted.

Good design, carefully chosen plants and meticulous garden housekeeping can make the smallest or shadiest city garden a source of profound interest and satisfaction and a thing of beauty.

HYBRID AMARYLLIS IN THE GREENHOUSE

J. F. Stewart, *California*

[Concluded from page 89, **Plant Life, Herbertia Edition,** 1958.]

The dormant season in the glasshouse, late fall and early winter, demonstrates the unpredictability of hybrid Amaryllis. Some will go completely dormant early, some late, some go semi-dormant but retain part of their leaves, and some continue growing right on through. Dormancy in full-grown bulbs probably is to be desired, and can usually be induced by cutting off the leaves and stopping watering. Young bulbs should be kept growing all year around. Fertilizing should be stopped but spraying continued during dormancy.

As soon as there is indication of new growth, by the appearance of a bud or a new leaf, the regular culture should be resumed. Root growth should, and usually does, start before leaf or bud appearance. Frequently this is not so, particularly in the case of newly imported bulbs, which are raised in hot houses and are soft and delicate, and it is advantageous, or even necessary, to apply bottom heat. This we do by setting the pot deep in the hot-bed, and lifting it as growth is established. The extent of root development can be judged by the stability of the bulb. One without roots can be easily displaced, but one with good roots remains solidly anchored. This testing should be done carefully.

The normal blooming season in our glasshouse is during March and April, about two months earlier than outdoors, but there is sure to be at least one bulb in bloom at all times except possibly for a period of a week or two during late December or early January. This is being written during late December and nothing is in bloom at the moment, but there is one scape a foot high and several buds well started. Beginning in about two weeks there will be a continuous display of a varying number of gorgeous blooms. Anticipation is a grand emotion. Perhaps the world's most glorious Amaryllis will appear this year, or if not this, possibly next.

Growth activity can be stimulated by increasing the heat at the root zone, but our attempts to force blooms during the dormant season have been entirely unsuccessful. Any flowers we have had at Christmas time have been fortuitous.

After potting the soil should be kept moist until the bulb is well established, then watered only when the soil surface starts to dry out. The soil surface should be cultivated occasionally, but not when wet, to keep it loose, and for better appearance. Apply water at the edge of the pot with a slowly running hose or a sprinkling can with the sprinkling cap removed, to avoid washing the soil. Keep water from the tops of the scales and the axils of the leaves. Arrange the pots on the benches so that there is a clear space of a few inches between them to allow for good ventilation, growing room for the leaves, and accessibility for watering, cultivating, spraying, etc.

A spraying program should be established, using fungicide and insecticide at regular intervals, even though there might be no indication of infestations. Prevention is much more easily accomplished than cure. We are getting what now seems to be fair, but not complete, fungus control by a thorough application every four to six weeks of a commercial Bordeaux type of material containing 2¾% copper and some oils, soaking the soil surface at the same time. This material does not seem to damage the foliage at the dilution used, does not clog the sprayer, nor leave an unsightly residue. For insect control we are using a commercial spray, containing malathion, lindane, chlordane and thiocyanate, which is very effective. This is also effective against mealy bugs, but at the required strength for this it is quite liable to damage the tenderer foliage. These two sprays are alternated, and applied soon after the pots are watered, so that the material will be undisturbed for as long as possible. A record of all spray procedure should be kept, showing dates and kinds of material used, as well as results.

Although the tissue of hybrid Amaryllis bulbs, including the roots and leaves, has a tendency to turn red as it deteriorates after physical damage, or damage by sprays, this does not necessarily indicate trouble, but there is a fungus, *Stagonospora* Leaf Scorch, which causes a red deterioration and is a most serious problem. Every effort should be made to control it when it appears. We have experimented to a limited extent with formaldehyde, mercuric chloride, and Bordeaux mixture as bulb dips. Any of the dilutions of formaldehyde used have damaged the bulbs, but it is possible that weaker solutions would be effective without bulb damage. The little experimenting with mercuric chloride seems to indicate that it might have possibilities, although the bulbs treated did show some set-back. A serious objection to mercuric chloride is its dangerous nature. Its fumes are a deadly poison and it should be handled only by those who are familiar with its characteristics. We still have a lot to learn about bulb dipping. Bordeaux mixture seems, at present, to be the best bet, both as a spray and a dip, and we expect to continue using it until some more effective, and safe, treatment is found.

Fertilizing potted stock is somewhat of a chore, since it is all hand work, must be done carefully, and requires a lot of leaning and stretching. The newly planted bulbs, whether dormant or active, are not fertilized for two or three months, or until they are established and growing well. From then on they are given 5-10-10 every six to eight weeks except during dormancy, about two teaspoons to a six or eight inch pot. Slip the small pointing trowel down flat against the inside face of the pot and, by turning it slightly and sliding it along, force the earth back to make a groove about an inch deep and most of the way around the pot. Distribute the fertilizer in this groove, replace the earth, and water it. It is usually recommended that no fertilizing be done in dry soil, but we have seen no signs of any damage having been done that way. We do not fertilize when the soil is too wet, but merely because it is bad practice to work wet soil. Fertilizers, being strong chemicals, should be kept from direct contact with the plants. Fertilizer left on the soil surface will mold. It should be covered or worked in. We have not used much liquid manure in the glasshouse, but do use some liquid ammonia as a booster at blooming time. Household ammonia is satisfactory at about one teaspoon to a quart of water.

For work in the glasshouse we use a ten inch brick-trowel, a brickmason's small pointing trowel, and a small hand cultivator. There are also two galvanized twelve quart pails, a couple of demoted stainless steel stew-pans, a set of measuring spoons, liberated from you-know-who's kitchen, and some miscellaneous tin cans. The ten inch trowel is used for mixing and handling soil, for which it is much better and stronger than the ordinary garden trowel, and for some digging. The pointing trowel, a constant companion and a very pleasant tool to use, is handy for lifting seedlings, preparing pots for fertilizer, small cultivating, working around and checking the propagating beds, and so on. The hand cultivator was originally three pronged but has been remodeled by having the long center prong removed, and the two short ones bent closer together until they are about ½″ apart. This is used in the pots, flats, seed beds, or wherever some scratching is needed. The tools are wiped clean and dry after use, to prevent rust, and because I like to see them shiny. There are some pieces of old bath towels hanging at convenient places for this and for hand wiping. There is a water valve with a hose connected at all times. A large thermometer, given to us by our plumber, hangs in a position to be readable from the doorway. We have a laboratory thermometer for checking the hot-bed temperatures.

Controlled breeding is best accomplished in the glasshouse. Since hybrid Amaryllis are of such diversified lineage, it seems impossible to predetermine the result of any specific mating, but cross-breeding should follow some plan, and complete notes be kept, so that any successful crosses can be repeated, and any information developed will be available for future use. A record should be kept of each cross, a marker with a serial number attached to the flower, which number should be kept with the seeds and bulbs until they have bloomed, and a complete history of the development kept in the notebook.

If the pollen is not to be used for breeding, the anthers should be removed from the flower before they have opened, and destroyed. If to be used, the anthers should, as soon as ripe, be transferred to a small container, such as a wide mouthed bottle or vial, being careful to protect the stigma from contact with any pollen. If the tweezers is used for picking the anthers, then the instrument should be cleaned in alcohol after each operation, to prevent mixing of pollen. Using brushes for pollination entails so much cleaning, or so many brushes, that we have adopted the procedure of making our own by attaching a wisp of cotton to the split end of a small stick, or applicator, about the size of a match but longer, with the aid of just a touch of glue. We keep one of these in each container, being careful not to misplace them, and destroy them at the end of their usefulness. When the stigma is ready for pollen it will have opened out and turned upward. It is at this time that it should be touched by the pollen laden cotten and a marker attached to the flower at once, since there might be a different cross on each flower of the scape.

Remove the seed pods from the stems when they start to split open, strip the seeds from the pods after the latter have ripened a short time, and store seeds in marked containers. Ordinary paper bags, grocery store kind, are the best thing we have found for this. They are left open until the seeds are cured. Fresh seeds stored in air tight containers will sweat, mold and sprout. Plant them as soon as possible, as germination seems to be best from fresh seeds, although we have raised many bulbs from year-old seeds.

There are a few remarks to offer in conclusion. Don't undertake such an extensive program that the great amount of work will tend to dull the joy. Work with high grade material, and for high grade results, rather than quantity. It takes just as much work and expense, and just as many years, to raise an unsatisfactory bulb as it does the very best, and, I blushingly admit, most of us like to do a little quiet, and I hope not too obvious, preening over the gorgeous results of our own efforts.

CULTURE OF HYMENOCALLIS NARCISSIFLORA AND ALLIES

Joseph C. Smith, *M. D.*

Southern California seems to be an ideal area for growing *Hymenocallis narcissiflora.* The writer started with a collection of sub-flowering sized bulbs ranging from three-fourth an inch to two inches in diameter and grew in one season bulbs that produced one and two flower scapes the following season.

It is reported from other parts of the country particularly from Florida that this species is difficult to maintain in a flowering condition when planted in the open ground. In this part of California it can be grown continuously in the ground, however, for reasons discussed below it is probably better to lift the bulbs annually. It goes dormant in the late fall and resumes growth in the spring about April when the soil is sufficiently warm. This is an average of about seven months of active growth and five months of dormancy.

Others conplain that their bulbs split into many sub-flowering sized bulbs and that these split again before they can grow them into a flowering sized bulb. It seems natural for this species to split each growing season, and the secret of success is to provide optimum growing conditions so that two or three of these splits return to flowering size the same season. Thus a large bulb may split into halves or thirds, and these new bulbs regain flowering strength as well as provide a number of smaller offsets for propagation purposes. Occasionally a large bulb will not split, but will produce a dozen or more small offsets while maintaining its own size. Again another bulb will produce no offsets at all or the whole bulb may turn into a cluster of offsets. There seems to be no way of predicting which will happen although more of the bulbs seem to maintain their size under the best cultural conditions.

The writer has had the best results in building up the size of the bulbs when they are planted in deeply tilled sandy loam to which is added a generous supply of peat moss. Regular watering and fertilizing are most beneficial. A standard brand lawn fertilizer was sprinkled on top of the soil in a dry form, care being taken not to get it lodged between the leaves. The writer burned most of the foliage off that way once early in the season by using ammonium sulfate, but produced a very excellent crop of bulbs that year. Good drainage is an essential. A deeply tilled sandy loam will drain adequately and the added peat will retain sufficient moisture between irrigations. The pH usually found during the growing season is 5.5 except following irrigation when it goes to 6.5 due to the local alkaline water of pH 7.5. It is possible that warm days and cool nights play a part in the growth of this species. The night temperatures in this part of California are seldom higher than seventy degrees and are often only sixty to sixty-five degrees during a large part of the growing season.

It seems advisable to dig the bulbs each autumn in order that the soil may be tilled and the bulbs separated. At planting time they are spaced eight inches apart and no cultivation is given during the growing season other than to pull out weeds. A top dressing of pulverized manure is applied twice a season. Commercial production of these bulbs is feasible since offsets can be turned into flowering sized bulbs in two growing seasons.

Cuttage methods of propagation have been tried but this is hardly necessary with most clones, except possibly with 'Sulfur Queen' and *H. amancaes.* Bulbs that are accidentally cut in digging usually produce offsets in storage so no pieces are thrown away. Bulbs may be cut into halves or quarters in the ground after they have become well established and these will then produce a number of offsets of a size that will require two additional growing seasons to make flowering sized bulbs.

During the past season the writer had bloom the entire months of April and May from bulbs planted on the eighteenth of March. The second scapes which bloomed three to four weeks later than the first ones were responsible for prolonging the season. If a portion of the bulbs had been held back and planted at appropriate intervals the season could have been much longer. 'Sulfur Queen' flowered as well as the white forms. *Hymenocallis narcissiflora* is easily grown as a summer flowering bulb in the garden in any part of the country that has at least a five month growing season. In other regions it can be started as a pot plant indoors and transferred to the garden after flowering as they usually flower soon after being planted. One can not have too many of these fragrant flowers.

VEGETATIVE PROPAGATION OF HYBRID AMARYLLIS

J. F. Stewart, *California*

In the Amaryllis Society "Year Book" for 1935 were published two very comprehensive articles on this same subject, one by Ida M. Luyten, and one by Hamilton P. Traub, from which were obtained all the information I had when starting my work, and which should be read by anyone interested in propagating *Amaryllis.* These articles have recently been summarized in Dr. Traub's "The Amaryllis Manual" (1958). I follow in the footsteps of these authors with humility, attempting to justify this article by making an effort to supply helpful practical details.

I have never found any information to indicate that there is any way to perpetuate a true strain of hybrid *Amaryllis* by seeds, the only known ways being by splits, offsets, and bulb cuttage. The last named amounts to no more than a method of artificially accelerating the production of offsets. I have tried both the Luyten and Traub methods, and have used soil, peat, and sand as media, and have obtained the most satisfactory results by using the Traub method of cutting, and sand as the medium. If the process described herein seems to entail a prohibitive amount of labor, be assured that you will find it is not so. The moment you decide to try bulb cuttage, the fun begins, and when, in checking the hot-bed, you find the first tiny bulb, all is forgiven. That is a "thrill that comes once in a lifetime". You at that moment become an addict, your creative instinct has an outlet, and from that moment on nothing that will further the process is too much work.

GLASSHOUSE.—It is questionable whether even in the warmer climates it would be desirable to have a propagating bed *elsewhere than in a glasshouse or similar enclosure,* but certainly not where freezing weather might occur, so only glasshouse culture is considered here. The house affords protection, for both the propagations and the propagator, from cold, wind and rain, and conserves hot-bed heat in cold weather. It should be of a size to accommodate the desired number of hot-beds, plus sufficient space for benches to hold the transplanted cuttings until they are ready to be put outdoors or into another glasshouse or lath-house. Large houses are better than small ones, but a hot-bed three feet by twelve feet will hold between two and three thousand cuttings. In a small house the hot-bed could be on one side and the pot bench on the other, while in a larger one the best place for the hot-beds is in the center, with the pot benches around the outside walls.

HOT-BEDS.—After trying, unsuccessfully, to propagate in a natural hot-bed, I investigated various kinds of artificial heat and decided that electricity would be the cheapest and by far the best. There are electric soil heating units of various lengths and capacities, as described later, but for a small operation the four hundred watt size, large enough for a bed of thirty six square feet, is about right. Because of space limitations ours are smaller. This, then, would determine the size of the beds to be built. The top of the beds should be about three feet above the floor, but to suit the proper working height for the person who is to use them. It is advantageous to have the beds no wider, from front to back, than three feet, because of the discomfort of working on material in the back of a wider one. The ideal size, then would be twelve feet by three feet. Two of these small units can be used to better advantage than one large one. As the amount of material in the beds is reduced by the continued transplanting of bulblets, and space becomes available, the remaining cuttings can gradually be moved to one bed, until everything has been removed from the second one, at which time it can be disconnected, with a consequent saving of electricity.

In our part of the country, California redwood lumber is used for long life in places exposed to the elements or in contact with the ground, and, among others, in glasshouses, although I believe cypress, cedar and others are used for similar purposes elsewhere. The bottom of our hot-bed is constructed of 1 by 6 six inch surfaced lumber with plain edges, set with enough space between boards to allow for expansion when wet. These boards should be supported by 2 by 4 inch joists not more than three feet apart, which are supported at the ends by 2 by 4 inch legs. One half inch drainage holes are bored about 1½ or 2 feet apart in these bottom boards, to be covered later by pot shards, to retain the sand but release excess water. The sides are made of one width of 1 by 6 boards on edge, making the inside depth of the bed a little less than five inches. Galvanized nails are used throughout, not smaller than eight penny, and if there is any tendency for the lumber to split, lead holes are drilled for the nails. A shelf is provided near the electrical outlet to hold the thermostatic control unit. Protect this unit from water spray or drip by some sort of roof or shield.

HEATING ELEMENT.—Electrical soil heating units are not readily available at the usual retail stores, but should difficulty be encountered in obtaining them, write to the General Electric Company, Construction Materials Division, Bridgeport 2, Connecticut for information. We obtained ours from the General Electric Supply Corp. in Long Beach, California, and use 400 watt #HS11040 heating units and #HSC2 thermostat assembly. Heaters can be obtained for 110, 220 or 440 volt current, but since our house is wired for one hundred ten volts, that is the size we use. It would be economical to use the higher voltages for larger operations.

The HSC2 thermostats are plugged into a double utility outlet near the beds, and the heaters are plugged into the thermostat assembly boxes, which are on the shelf provided for them.

Attached to the thermostatic switch by a capillary tube is the sensitive bulb which is affected by temperature changes in such a way as to cause the switch to open or close. The temperatures of opening and closing can be adjusted, within the limits of the switch, by a control knob on the unit. Ours is set so that it will turn on at about 69°—70°F., and off at 82°—83°F. The sensitive tube, or bulb, is installed near the partition dividing the two beds, so that it will be in an area of average temperature, and will not interfere with the setting of the flats. It is set on a block of wood, laid on the bottom of the bed, which is of the proper thickness to hold the bulb at the same level as the inside bottom of the flats. The adjustment of the units is checked by a laboratory, or other reasonably accurate, thermometer, the bulb of which is inserted down into the sand adjacent to the bulb of the thermostatic switch, and changing the unit control knob to suit. This is a lengthy operation, since it takes a long time to change from maximum to minimum and back, and you have to be there when the switch clicks on or off, but it is necessary that it be done accurately before setting cuttings in the bed.

We have four beds, with only two in use at this writing, and the second two will be controlled, by the second thermostat. This will allow temperature variations for experimental purposes, or for two beds to be used for forcing while the other two are being used for propagating.

The heating unit is laid out on the bottom of the hot-bed, in the shape of a rectangular coil, with the outer wires about three inches from the sides of the bed and the ensuing ones from four to six inches apart, depending upon the size of the bed. Helpful information and illustrations are furnished with the units. The unit should be handled with care so that neither the insulation nor the lead sheath are damaged, and the bends should be made with a minimum radius of two inches, never sharp. After the coil is laid out in a preliminary position, the spacing for uniformity is adjusted, the wire is straightened out to make a neat, workman-like job. Enough wire has to be left at the plug end to easily reach the outlet-box of the thermostat. Redwood lath, which is a little thicker than the heating coil, is cut into lengths to fit between the wires of the coil to keep them spaced. These are liable to split, so nail holes are drilled through them, and they are fastened in place with galvanized shingle nails. More laths are cut into lengths to extend full width of the bed and these are nailed down on top of the spacers so that the nails do not touch the coil. These strips are to protect the coil, and to support the propagating flats at a uniform level, far enough above the coil to allow a reasonably even distribution of heat to the cuttings.

FLATS.—The cuttings are set in flats, rather than in the open bed, to prevent loss or mixing, to keep all at the same depths where the heat will be uniform, to keep them, or their roots, from direct contact with the coil, and to allow for the removal of any group of cuttings without disturbing others. A flat just large enough to hold the cuttings from one bulb is the ideal size. You may eventually have several bulbs of the same kind to propagate, but at first you will probably have only one of a kind, and you will be cutting single bulbs at various times throughout the year, so these small flats will serve better than large ones.

Flats 10 by 15 inches inside, or 11½ by 16½ inches outside, will nest well in a twelve 12 by 3 ft bed, and will hold one hundred cuttings comfortably, more by crowding. A bulb seldom cuts into more than a hundred pieces. For the sides and ends of the flats use 1 by 4 inch finished redwood, making the inside depth 3½ inches. The bottoms are made of one-half inch redwood lath or battens, which will split unless nail holes are drilled. The wood swells when wet, so the lath should be soaked before use. The edges should be notched slightly so that water will drain easily but sand will be retained. Drainage is important. Standing water will soon become stagnant, especially at hot-bed temperatures.

PROPAGATING MEDIUM.—I have experiences with soil, peat, and sand, and the results were so much better with the sand that I use it exclusively now. It is common concrete sand, sifted through a one eighth inch mesh screen, and the fine dust is removed by washing. This is done by half filling a tub with sand, and then, with a fast running hose, filling the tub with water and agitating the sand with the hose jet so that the fine particles are carried away by the overflowing water.

The bulb of the thermostat is installed in the bed as previously noted, sand is placed in the bed level with the protecting laths, and the flats are placed in position. They are filled, and around and between them, with sand level with the tops of the flats. Then wet down the entire bed. This is the time to adjust the thermostatic control, before any cuttings are placed.

PREPARATION OF BULBS AND CUTTINGS.—Judging by my own experience, it seems advisable for the beginner to start experimenting with something less than his most desirable bulbs, so that failure would not be a catastrophe. As soon as he begins to have confidence he should propagate only the best stock, and waste no further time on inferior material, since three years of time and effort is too much to spend on low grade bulbs. We propagate only named, or to be named, bulbs, and make it a rule never to cut a bulb unless we have another like it, or at least one off-set, so that we take no chance of losing something good. Include a wide variety, to determine which do best. Propagating any bulb less than three years old does not give maximum results, and the bulbs used should be strong and healthy.

After bulbs are dug, cut the tops down to within about a half inch of the swell of the bulb, trim the roots close to the base, wash bulbs thoroughly, cut off any dry or bad material, and dip them in a Bordeaux mixture for a few hours. After drying they are ready to cut. Keep a marker with each bulb, or each kind if more than one of a kind are cut.

For cutting use a knife having a thin blade at least four inches long, with a good point, and keep it sharp. Use a light, clean board, or piece of plywood, about two feet by three, and place it where you can sit down to do the cutting. Hold the bulb upright with its bottom on the board, and cut it in half by cutting down from top to bottom, as in halving an apple. Then in the same way cut the halves in two, the quarters in two, and the eighths in two, making sixteen segments. Lay a segment flat on the board and cut it into four, five, or six pieces, depending upon the size of the bulb, by slipping the knife between every other scale layer and cutting through the stem fraction so that each cutting has two layers of scale with some of the stem fraction attached. We have never known the very tender center sections to produce a bulb, so discard them. (Editorial note.—These may be used for experimenting; using hormones or antibiotics.) The cuttings from each bulb are kept in a separate container of cold water, with their marker, until ready for setting. We use Vitamin B1 in this water, and in the water with which the sand in the flats is soaked after the new cuttings are first set. The Vitamin seems to have a tonic effect, and we use it generously on cuttings, transplants, etc. It is well to cut a number of bulbs at one sitting, for economy of effort, and then do the setting in flats all at one time. Watch the markers. Clean up thoroughly after each operation.

SETTING CUTTINGS.—Spread about one half inch of moist sand over the bottom of the flat. Bank about three quarters of an inch against the far end, smoothing it with the small trowel and leave the face sloping slightly away from you. The cuttings will stay in place better against this slope than they would against a vertical face. Place the first cutting close to the left side, if you are right-handed, upright against the end sand, with the root zone end at the level of the sand in the bottom of the flat, and the hollow face of the cutting to the right. Press it lightly into the sand so it will stay in position, then nest the next one close to it, but not touching, and so on until the row is completed, which will be ten to twelve pieces. Then, with the trowel, place another three quarters of an inch of sand as at the end wall, place another row of cuttings, and continue thus until the flat is full or the cuttings are all set. Water carefully but thoroughly, with Vitamin solution, settling the sand, and adding more sand, if necessary, to fill the flat to the top. Place the marker.

After the cuttings are set, keep the sand moist at all times, but be sure that the flats drain. Check the temperature regularly, and at the end of a month open the sand at one corner of the flat to see what has happened. There will normally be no bulblets started at this time, so if the cuttings seem healthy, replace them, water them, and hold your breath for another month. That should be the great moment. In opening the flat at that time you are quite sure to find some bulblets, and, if so, it would be well to go through the entire flat, remove bad material and decayed cuttings, and re-set the good ones as at first. When the bulblets have developed *a good strong leaf and some good roots* they can be transplanted, but do not transplant too soon, and lose them. They can be transplanted into four-inch pots or into flats, depending upon the number of cuttings involved and the ultimate destination. A little bottom heat helps at this stage if they are slow starting, but they should be hardened off after good growth is assured, if they are to be transplanted outdoors. For bottom heat the pots or flats are set part way into the sand of the hot-bed, and to harden off are set on top of the sand for a few weeks, then on the pot-benches for a few weeks. If they are to go outside at this early age they should be set outside in the pots or flats for several weeks before being transplanted. It is not entirely safe to transplant a bulb smaller than one inch in diameter to the ground outdoors. If to be grown on in pots or cans they can be transplanted the second year. Gallon cans or seven or eight inch pots are satisfactory, but my preference is the eight inch pot, which is large enough for offsets to grow to good transplanting size.

CONCLUSION.—Don't hurry things. Give the young bulblets time to develop before transplanting. Spray regularly with insecticide and fungicide, and keep everything as sanitary as possible. Ventilate well when the weather will permit. Use no fertilizers until bulbs are transplanted and growing well in their new locations.

Start now, take it step by step, be thorough, keep complete records, and the first thing you know you will have developed your own successful technique, and will be writing it up for the next HERBERTIA.

LYCORIS — OLD AND NEW

WILLIE MAY KELL, *Texas*

The Genus *Lycoris* is a desirable addition to the beautiful flowering bulbs in the gardens of the South, as most of the species make choice cut flowers, some of which will last a week when cut. For many years, *Lycoris radiata* was almost the only one generally found in these gardens, but was called "Guernsey-Lily" (=*Nerine sariensis)* until 1936 when the correct name of the species was reported as *Lycoris radiata* by Mr.

James of California and Mr. Hayward of Florida in the yearbook of the AMERICAN AMARYLLIS SOCIETY. This species is wide-spread in the gardens of the South, as they have been found to be hardy as well as easy to grow by the average amateur gardener, flowering brilliantly year after year. On the average they begin the first week in September here, when there are few flowers after the extreme heat and drouth of August and July throughout a large area of Texas.

In Florida, *Lycoris aurea* was to be found in very old gardens under the usual designation of ''Hurricane-Lily'', but was slow to be used elsewhere until later when its cultivation slowly spread along the Gulf Coast westward. *Lycoris squamigera* was listed for many years in the fall catalogues of bulb growers as *''Amaryllis hallii,''* and is often so listed as yet.

The season here opens with *Lycoris squamigera.* The flowers are beautiful in form and color, and make a choice cut flower which will last a week. In fact, the flowers open and mature so beautifully when cut and brought inside out of the extreme heat of the season of bloom. The size, form and color vary widely from flower to flower on different scapes and where grown in different locations. Those in full shade and a moist location being superior in size, color, and lasting quality as a cut flower to those in full sun with no ground cover. In some flowers, the edges were straight with only the tips of the tepalsegs curled back; others had the edges of the tepalsegs quite ruffled, and curved back sharply from the center of the flower, making a very wide-open flower. Some had much narrower tepalsegs, also very ruffled and curved back sharply. There was as much variation in the color shades on different scapes as well. The color was exceptionally good for most bulbs this season (1957) as there were abundant spring rains. The flowers numbered 4, 5, 6, 7, 8, and even a few with ten blooms to a scape. The diameter of the flower was 3¾″, tepalsegs 4⅛″ x ¾″. The color was #621/3 carmine rose (Horticultural Colour Chart which is used throughout unless otherwise stated) with tips of tepalsegs #640/1 wisteria blue and touches along the edges of the tepalsegs same or both having #628/2 to #628/3 Persian rose. Stamens were 1½″ long, color #031/2 Lilac Purple; pistil 2½″ long, color #031/1 lilac purple. The colors varied as the flowers matured. These have a slight fragrance. The first flower opened this season, July 27th and the last August 15th. Those in full shade and moist location were almost through before those in full sun and no ground cover started to flower and the flowers burnt very quickly. By August 7th, 58 scapes had flowered. This species does not make winter leaf growth, but when it does leaf out in the late February makes a quick and vigorous growth.

Lycoris incarnata started flowering August 1st. The first scape was 22″ long, with 8 flowers; tepalsegs 4″ x ⅝″; color of inside stripe #433 pastel mauve; outside stripe #027 magenta rose; background of tepalseg pastel mauve #433/3. On August 15th, there were scapes of 26″ to 27½″ long; tepalsegs 3¼″ and 3½″ long; diameter of flower 2½″; inside stripe pastel mauve #433; outside stripe phlox purple #632/2;

center edge of tepalsegs persian rose #028/2; stamens 1¾″ long, color lilac purple #031/1; pistil 2¾″ long, color 031; anthers orange. August 28th and September 3rd,—*Lycoris incarnata* growing in full sun and no ground cover burned badly. The flowers would not compare with those flowering earlier in full shade. One thing conducive to this was due to the fact that there was no measurable moisture for the entire month of August. We had spring floods when the water stood in the flower beds. The hard clay soil here has the property of becoming so impervious to water after the rains have stood and not drained off, it will hold water like a jug. But this is the condition of the soil which makes it possible for the ranchers and farmers to have their "Texas Tanks" for small earthern dams are thrown up and the overflow from big rains fill up these shallow or even deep tanks and hold water for long periods, thus giving stock water over the entire area. This delay in flowering was more noticeable in *Lycoris incarnata* than even in most of the other lycoris but was true of all lycoris grown in full sun. There was no winter leaf growth by December 1st.

Lycoris Houdyshelli had the first flower August 14th. One bulb was obtained from Mr. Hayward in May of 1949, and was planted at once in a location which was undoubtedly most favorable to its best growth. This bulb was marked "LYCORIS ALBA", but was such an outstanding flower of grace and beauty, that, from its first flowering, was recognized as a real treasure. It was never transplanted so did not have the set back of others often transplanted more than once. Here it has been found that transplanting lycoris, even when dormant, delays their flowering. Some purchased, which have been too long delayed through importations to dealers, and then in transit to customer, have been three years before flowering. They seem to resent being disturbed. The beauty of grace and form and color in *Lycoris houdyshelii* are far superior to any other lycoris. They have to be seen and compared with other lycoris to be fully appreciated. This season there were 8 scapes varying from a small late one of 11¼″ to 25½″ and 26¼″ with 7, 8, and 9 flowers to a scape. The buds are a warm white with the stamens and pistil extruding from the tight bud, with the anthers showing a color of terra cotta (French) and becoming a zinc orange (Ridgway) on the open flowers. The flower becomes less cream as it matures and makes an absolutely perfect white flower. The tepalsegs curve back sharply from the center of the flower with a wide gap between the two lowest, through which the stamens and pistil curve out and up so gracefully. The tepalsegs are delicate in texture, are ruffled, and have light touches of soft red at the edges and sometimes a pencil-line of the red on the inside of the tepalsegs, but these touches of color are so soft and faint as only to be seen by very close observation. They make a most beautiful and desirable cut flower of good lasting quality. The tepalsegs measure 2¼″ long; stamens 2¾″ and pistil 3¾″ long. On August 23rd, the first flower on the last scape opened. The flowers produce seeds when hand-pollinated. The leaf growth started October 5th. These leaves are very distinct from any other Lycoris, and remain all winter, and up to the present time have been winter hardy here. The leaf has a thick rounded tip, is much broader than any others except *Lycoris traubii* (however very different from *Lycoris traubii* which is a bright shining green, very glossy). The leaf averages 11¾″ x ¾″. The center stripe is channeled but not conspicuously like *Lycoris radiata.* The color is quite a different green, but the R. H. S. Colour Chart does not show a green near enough to distinguish it. The nearest, but still not accurate, is yew green (Merz & Paul). The bulb has increased to four large ones as near as can be ascertained without disturbing it. Mr. Caldwell, in the 1957 issue of HERBERTIA, has adequately described it, and shows a picture of same.

Lycoris Sanguinea is most disappointing. It may be of interest to collectors, but is not ornamental, and makes a poor cut flower on account of its small flower of poor form and color. It does not answer to the description given in Grey's HARDY BULBS. Stock from four different sources are all the same poor flowers of the same harsh color. The flowers opened August 7th on two clumps and August 10th on the third and fourth group. The first scape was 8″ with two flowers. The tepalsegs were 2¼″ x ⅜″; stamens 1¼″ long; pistil 2¼″, anthers light straw color. The flower is jasper red 018/1; two other flowers were jasper red #018. They seem to be winter hardy, and do not make winter leaf growth. Two seed pods formed and fell down besides the bulb without hand-pollination by August 24th.

''Lycoris albiflora carnea'' is a very dainty and delicate flower, and makes a beautiful arrangement with the old rose 'Madame Jules Bouche'. It started flowering August 23rd. There is a larger number of these than most of the others, due to the fact that all bought as ''Lycoris albiflora'' and ''Lycoris radiata alba'' have proven to be ''Lycoris albiflora carnea'' with the one exception. This group bought December, 1950 as ''Lycoris radiata alba'' had 2 scapes, this summer, of white flowers among the rest of the clump which were ''albiflora carnea''. These were exactly like the ''albiflora carnea'' except for color. The first scape was 17″ long with an umbel of 5½″ across; diameter of flower, 2½″; tepalsegs 2¼″ x ⅜″; stamens 2½″ long; pistil 3″ long; both stamens and pistil cream with the tip of the pistil deep pink. The color of the flower was Venetian pink #420. These do extra well and multiply more rapidly than most lycoris. A planting of one dozen bulbs set out in September, 1954, had 19 scapes this season. One scape flowering August 27th, was 23″ long, flower umbel 5½″ across; color Venetian pink #420/2. On September 5th, there were scapes 16″, 21″ 22″ long, and the tallest was 28″, all with 7 or 8 flowers to the scape. Those flowering September 9th, in full sun, had mediocre flowers which burned quickly. The leaf growth was vigorous by December 1st. The leaf is 21″ x ¾″ but narrows at the tip to ¼″ wide; color spinel green #0960/1. In one purchase of ''Lycoris albiflora carnea'', planted September, 1954 there are 3 scapes with creamy flowers. The flowers were a little larger than ''albiflora carnea'', tepalsegs 2¾″ x ⅜″, curled back sharply from the center; diameter of flower 3¼″; stamens 2¾″ long; pistil 3¾″ long, both stamens and pistil are cream and flare out and curve up; anthers chamois (French). The color of these flowers is mimosa yellow #602/3, with a center line inside the tepalsegs of flesh pink.

Lycoris Caldwellii, planted May, 1955, had its first flowers August 21st. There were 3 scapes, the first was 25¾″ tall with 6 flowers, tepalsegs 3½″ x ½″; stamens 2″; pistil 3″ long, both stamens and pistil were light orange with the tip of the pistil pinkish. The second and third scapes were 22½″ and 21½″ tall. The bud is peachy. No record was made of the color but it was a very soft light yellow. The bulb was obtained from Mr. Hayward, the same source as those obtained by Mr. Caldwell, and described in the 1957 issue of HERBERTIA.

''Lycoris purpurea'' was obtained from Mr. Hayward in 1949, but it did not have the proper location nor care and has also suffered from too much transplanting. It flowered September 5th, but like all the other lycoris in full sun and no ground cover, was not a choice flower. The scape was 10⅞″ tall with 5 flowers; the tepalsegs were 2½″ x ⅜″; stamens 2″; pistal 2½″ long; both stamens and pistil are the same color as the petal which is mallow purple #630/1. The edges and tip of the petal are wisteria blue #640. Mr. Caldwell who obtained the same stock from Mr. Hayward advises me he thinks it is *Lycoris sprengeri,* but if this is true to name then it is the first of that species to flower here. Stock of *Lycoris sprengeri* has been purchased four times but none have ever flowered. This lycoris is quite different from any others grown here.

Lycoris radiata was late this season as it did not bloom until September 11th when, ordinarily it commences with the first days of the month. These are iron-clad here, only requiring slow, deep watering the last week of August, shade, left without being disturbed. They make a good cut flower, and a brilliant display in the garden. They are commonly grown over a wide area of Texas and the whole South. The leaf growth begins before the flowers are fully matured, and this leaf growth remains until early Spring. The leaf measures 28½″ x ½″, narrowing to the tip to ¼″ and broadening at the base to ⅜″.

Lycoris traubii was purchased as ''Yellow Spider-Lily''. One purchase from a dealer, who imported the bulbs direct from Japan, has been of great interest as there is such a wide variation of form, size, and shades of color together with flowers of grace and beauty. These new yellows are so superior to *Lycoris aurea* in not only the choice flowers but also in their greater hardiness to the climate here. September 19th, there were 9 scapes, the tallest being 22½″ with 6 flowers, tepalsegs 3″ x ½″; stamens 2½″; pistil 3½″ long, both stamens and pistil curve out and up gracefully; color maize yellow #607; anthers #607; stamens and pistil #607/2. September 21st the tallest scape was 22½″ with 7 flowers; tepalsegs 3¼″ x ¾″. The texture of the tepalsegs was much thicker and heavier than in the earlier flowers, and there was a center line inside the petal of a darker shade than the flower which was maize yellow #607. September 22nd there was a scape 19½″ tall with 8 flowers, the color was orange buff #507. September 23rd there were 2 scapes with flowers, 7 each, of saffron yellow #7. September 28th, there were 2 scapes with 7 flowers each of maize yellow #607; and one scape 14½″ with 4 flowers Chinese yellow #606/1; petals 3″ x ½″, curled, rolled, and a center line inside the petal maize yellow #607. The last flower—October 10th. This collection of the new yellow lycoris besides being different in color, were as varied in the forms of the tepalsegs, some being smooth and straight, some ruffled, some only curled back at the tips of the tepalsegs, some curved back sharply from the center of the flower, making a very wide-open flower. The leaf growth starts very shortly after the flower finishes blooming, and is very vigorous and distinct. The leaf is broader than any others with the exceptions mentioned previously, and is a bright glossy, shining green, measuring 12½″ x 1⅛″ to ¼″ at the tip and ½″ at the base; color parsley green #00962. Another group has a leaf measuring 14¾″ x 1⅛″ to ½″ at tip and ½″ at base, very shiny and glossy; color spinel green #0960.

Lycoris aurea is most inferior in flower to *Lycoris traubii.* The winter leaf growth is sometimes damaged by hard freeze; besides it does not grow vigorously enough to multiply well. The flower is much inferior to the new yellows in form, size, and color besides lacking the grace and beauty of form. The first flower opened October 1st, with a scape 19¾″ tall and 5 flowers; tepalsegs 3½″ x ⅜″; stamens 4″; pistil 5¼″ long, color Egyptian buff #407/1. The tepalsegs, stamens and pistil all grow straight up together with only a slight curl at the tips of the tepalsegs.

Another *Lycoris* has been grown here but was lost, due to the lack of knowledge of its cultural requirements, as well as the lack of proper care and attention. This bulb was obtained from Orpet Nursery in Santa Barbara, California, March, 1945, under the listing ''Lycoris incarnata Hybrid''. It flowered in 1947, and answered to the description now given for *Lycoris straminea.* It was a very soft, delicate yellow with the tips and edges of the petals having touches of a deep rose or soft red. There should be some of this stock still to be found in California.

The article written by Mr. Sam Caldwell, together with his pictures in the 1957 issue of HERBERTIA has been the means of locating the correct names of the *Lycoris* which have been established and flowered here, though their beauty and worth have been enjoyed these years as ''roses by other names''.

CONTROL OF MITES AND THRIPS ON HEMEROCALLIS

Although mites and thrips on *Hemerocallis* grown at La Jolla, Calif., do not materially retard diploids and tetraploids, it is still desirable to control these pests if possible. It was found that such tetraploids as 'Copernicus' and 'Elizabeth Traub' with upright foliage do not harbor the pests when regularly given overhead waterings during the growing season. Clones with arching foliage do harbor the pests to some extent.—*Hamilton P. Traub*

HAEMANTHUS MULTIFLORUS CULTURE

WYNDHAM HAYWARD, *Florida*

Haemanthus multiflorus, the tropical AFRICAN BLOOD LILY, is a flowering bulb of colorful history and great present possibilities. Pictured by many famous plant artists in the past, including the great P. J. Redoute in his ''Liliacees'' of 150 years ago, it is still a beautiful and showy conversation piece of the sub-tropical garden and northern greenhouse or conservatory.

The accompanying illustration (Plate 6), generously provided by the well known wholesale bulb firm of Walter J. Guille, Inc., Syosset, L. I., reveals better than ten thousand words why this remarkable plant, known for 300 years, has been an eye-catcher and traffic-stopper wherever and whenever shown, but fails to show why it has not become more widely grown and more popular with lovers of fine plants.

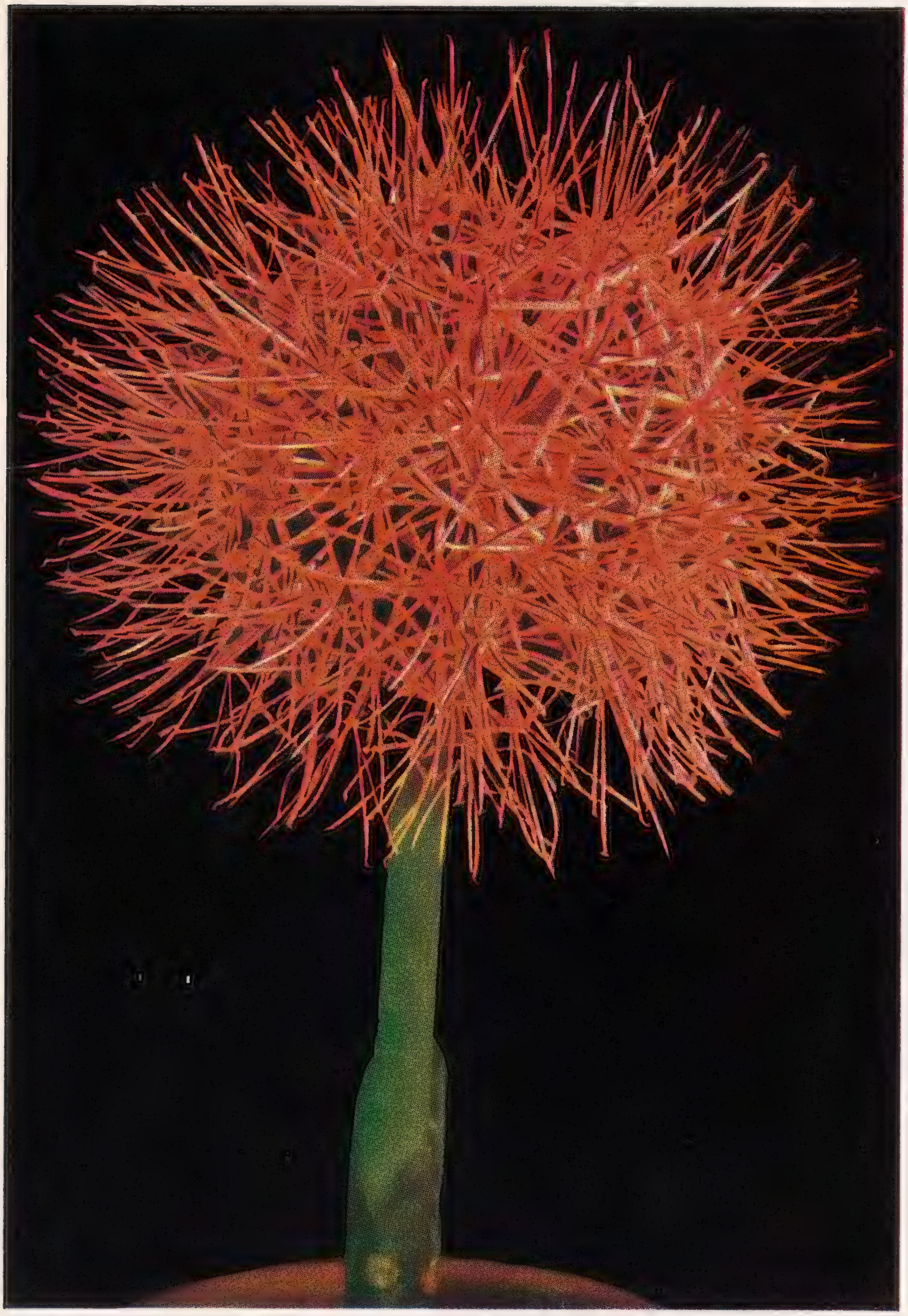
Perhaps it is just neglect. Also the scarcity of material, as the bulb is a shy seeder, and makes offsets slowly, although a good increase can be obtained from year to year with good culture. Although Henry Nehrling wrote of bulbs of *Haemanthus kalbreyeri* (a form of H. multiflorus from Guinea) in his gardens at Gotha, Florida in 1908, fifty years later it is still a rare bulb in Florida, cherished and pampered by those horticulturists fortunate enough to possess good flowering size specimens.

The writer has a photostat of what is obviously *Haemanthus multiflorus,* as illustrated in the rare early French garden book, ''Le Jardin du Roi,'' by Pierre Vallet, published according to Pritzel in 1608 in its first edition at Paris. Vallet names the bulb ''Satyrium'' from Guinea. *Satyrium* of course is the name for a present-day genus of orchids, but the plant in Vallet's plate is plainly our old friend the AFRICAN BLOOD LILY. It is curious that J. B. Ferrarius, who obtained other rare bulbs from France, should not have pictured this species in his De Florum Cultura of 1633 at Rome, when he published excellent plates of *Haemanthus coccineus,* a South African species.

According to Baker, in 1888, *H. multiflorus* is found ''throughout tropical Africa from Sierra Leone (west Africa) to Abyssinia (northeast) and to Delagoa Bay (South Africa),'' and doubtless the amazingly wide distribution accounts for the numerous synonyms now found under this species in the botanical literature. Baker's own *H. kalbreyeri,* under which this species is now found even today in the Eastern nurseries, (whence come most of the commercial stock of bulbs in the trade) seems to be a smaller form according to his own description of 1877, ''umbel 5 to 6 inches'', being a comparatively small one for the species.

Under optimum culture in Florida, usually in large pots or tubs, *H. multiflorus* bulbs have been known to produce ''fire-ball'' blooms of flowers a foot in diameter and on three to four foot stems, from bulbs up to five or six inches in diameter. Bulbs of this size have been carefully grown for many seasons. The average blooming size bulb ranges from two to three inches in diameter, similar to *Amaryllis* hybrids.

The writer in the company of Dr. H. P. Traub some 20 years ago came on a planting of several hundred of the bulbs all in bloom in a



PRINTED IN THE NETHERLANDS

Plate 6. *Haemanthus multiflorus* Martyn, a popular cultivated bulbous amaryllid; widely distributed in the wild in tropical Africa from Sierra Leone to Kordofan, Abyssinia and Delagoa Bay. Color plate by the courtesy of Walter J. Guille, Inc., Syosset, L. I., New York.

yard in Eustis, Florida, some of the bulbs in washtubs, pots and cans, others in long lines along the path to the well-worn home of the owner. When this discovery was made public the entire stock of the bulbs was bought up by local garden club members in a few months at a dollar a bulb, a bargain, because good blooming size bulbs of this species have always sold for $3.00 to $5.00 or more each in the retail trade in this country. Inquiry of the family as to the origin of their bulbs elicited the information that ''Grandma got a bulb off a sailor in St. Augustine many years ago . . .''

Bulbs of *H. multiflorus* are best planted in early spring, and allowed to root a few weeks before they make their natural bloom in May or June. They like a fertile, leaf-mold type sandy loam compost, well drained and not too heavy. Manure, especially well rotted, suits them well, and they will take occasional applications of any good garden commercial fertilizer, stirred into the soil around them. They appreciate half shade conditions. Offsets can be separated at planting time just as with hybrid *Amaryllis.*

Simultaneously with the bloom spike, the leaves begin to grow and make a handsome fountain of foliage by the end of summer, produced on a short sheathing stem, with oblong blades, up to a foot long and having short sheathing petioles. The stems are usually rusty-spotted. The bulbs can be potted in six, seven or eight inch pots according to size. Small bulbs can be potted up individually or several in a large pot or flat and allowed to grow on.

The *H. multiflorus* is amenable to vegetative propagation and the stock could be increased enormously in a few years by careful cuttage procedure like *Amaryllis.* There is a report on this in early issues of HERBERTIA. The basal stem is larger than in the hybrid *Amaryllis,* and the root system heavier and larger by the end of the season. The foliage goes to rest from November to January unless cut down by frost in the lower South and similarly under glass. There are few pests, save possibly thrips, red spider, grasshoppers, or caterpillars.

The bloom spike or scape rises separately from the leafy stem and the umbel opens with 100 or 150 or perhaps even more small flowers in top specimens. Baker says merely ''umbel dense, 3 to 6 inches in diameter'', which is a conservative measurement. This species' only rival in the genus in common cultivation is *H. katherinae,* a somewhat similar plant from South Africa, with orange red flowers blooming in summer, later than the other. *H. katherinae* is almost evergreen, more sensitive and not as ''fool-proof'' in the writer's experience, at least in Florida, although the *H. katherinae* is grown more widely in California.

TETRAPLOID DAYLILY—'LUCRETIUS'

The plant of this clone is up to 39″ tall; up to 13 flowers per scape; evergreen; recurrent blooming. Flowers are wide open, up to 7″ wide, thick substance, bright cadmium orange (HCC 8/1), 38 vivid orange DCN, faint rounded reddish eye-zone, segs acute, margins ruffled, petsegs creped; fragrant.—*Hamilton P. Traub*

CULTURE OF BRUNSVIGIA, CRINUM, NERINE AND ALLIES

L. S. Hannibal, *California*

In California there is undoubtedly no easier group of garden amaryllids to grow than the common member of the tribe Brunsvigieae which contains *Brunsvigia,* including the Cape Belladonna*;* the hardier species of *Crinum,* X *Crinodonna* (syn.—*Amarcrinum), Nerine;* X *Brunserine; Ammocharis; Boophone* and *Cybistetes.* All of these plants do best in a heavy clay-loam or adobe soil, but crinums and X *Crinodonna* normally require considerably more moisture than the others which go into a dry summer rest period. As a consequence, crinums are best adapted to the southeastern United States, particularly Florida and the Gulf Coast while the others are better adapted to the dryer summers of central and southern California, and southern Arizona.

In essence, if the plants are given the right environment they will take care of themselves as they do in the wild and need no care whatsoever, but try growing *Brunsvigia rosea* in Florida's humid summer climate, or *Crinum americanum,* an aquatic Florida species, unattended under Californias dry conditions, and both bulbs will soon pass out of the picture. All the loving care possible will never adapt these bulbs to conditions which are adverse to their native environment. However, by generous applications of water one can grow moisture loving bulbs under dry climate conditions and be fairly successful, but to give summer resting bulbs a dry rest out doors in a humid climate is not feasible. Thus it is no problem for the writer to grow most of the Crinum species and hybrids, but the nearest safe approach to the Cape Belladonna, *Brunsvigia rosea* for our Florida friends is X *Crinodonna (B. rosea* x *C. moorei* hybrid) which can take the moisture due to the *Crinum* parent.

The propagation of any *Crinum, Nerine,* or *Brunsvigia* or related plant starts with pollination. Many members of this South African group respond poorly to their own pollen. Particularly if the plant is a species which has a long history of natural inbreeding where a lack of minor variations has produced a homozygous individual without diversity. Such plants respond poorly to their own pollen and whatever seed which may be produced may quite possibly be parthenogenetic in lieu of sexual in origin. But cross this same plant with a different clone of the same species or a related subspecies and nominally a heavy crop of seed results. The writer has in mind *C. bulbispermum* var. *sanguineum* which rarely if ever sets seed by its own pollen, but pollen from the Cape form of *C. bulbispermum,* or Burbanks hybrid, or *C. moorei,* or even *C. yemenense* produce all kinds of hybrid sexual seeds which germinate rapidly and grow extremely vigorously due to the factor of hybrid vigor (Fig. 20).

Not all *Crinum* species set seed as easily. *C. kirkii* is persistently sterile despite the use of pollen from several divergent clones, and *C. macowani* is very chary with its seed. Many of the hybrids are sterile or near sterile, and often the seedlings are questionably parthenogenetic. The seedling plants from *C.* 'Cecil Houdyshel' are a typical example.

Species of *Nerine* also produce all kinds of breeding problems. *N. fothergillii* is practically sterile, and crosses with other clones with extreme difficulty. *N. bowdenii* and *N. humilis* consistently produce parthenogenetic seed, that of *humilis* is initiated by other pollens whereas *bowdenii* requires no pollen whatsoever and will set seed despite emasculation or high water. Most of the other *Nerine* species as well as the hybrids nominally require pollen to initiate seed development, but a fair portion of the hybrids may be parthenogenetic. At least the results are so confusing that this field needs further investigation.

Brunsvigia appendiculata apparently sets both parthenogenetic and sexual seed, and surprisingly enough this plant crosses extremely easy with *N. humilis* to give robust hybrids. This is not the first hybrid of this kind since *N. x fletcheri,* a cross of *N. bowdenii x Brunsvigia rosea,* has been known for years, but the ease of the writer's cross suggests no significant division between some of the species of *Nerine* and *Eubrunsvigia. Brunsvigia slateriana* shows minor clonal variations and sets only sexual seed. The writer has never succeeded in crossing *B. slateriana* with either *B. rosea* or the Multiflora hybrids which contain *B. grandiflora* genes.

B. rosea, the Cape Belladonna as a species is notorious for producing nonsexual seeds when one is working with a homozygous clone, but the presence of a different clone during flowering season will give excessive yields of sexual seed. The *B. x multiflora* garden forms, which are crosses of *B. rosea* and *B. grandiflora* set excessive quantities of sexual seed, probably because these clones are such a complete heterozygous mixture.

X *Crinodonna corsii,* the bigeneric hybrid, which is a cross of *Crinum moorei* on *Brunsvigia rosea* as a seed parent, is readily obtained if one has the proper clones on both sides. Surprisingly enough many of the Multiflora hybrids will yield a few X *Crinodonna* seed, but these do not differ greatly from the typical cross. The hybrid seed are quite distinct from those of *B. rosea,* being a pale opal green, whereas those of *B. rosea* are red. The X *Crinodonna* hybrid itself is sterile.

Pollinations in *Crinum* and *Brunsvigia* are usually most successful if conducted in the late afternoon. The flowers open at this time and fresh pollen is available. Fertilization is usually better because the pollen does not dry out during the night on the stigma, whereas in daytime it soon loses vigor.

Seeds are usually collected from *Nerine* and *B. rosea* after the pods start drying but before they split and spill the seeds. Selected seed pods are placed in plastic food dishes or pans to ripen. Usually before the seed starts to sprout it is examined for small buckshot or other malformed types. In the case of *B. x multiflora* the white seeds are often segregated to permit shipment or sale of alba-flowered seedling segregates.

A planting mix of heavy loam, vermiculite and sand is commonly employed by the writer for the sprouting of seeds of the above genera.

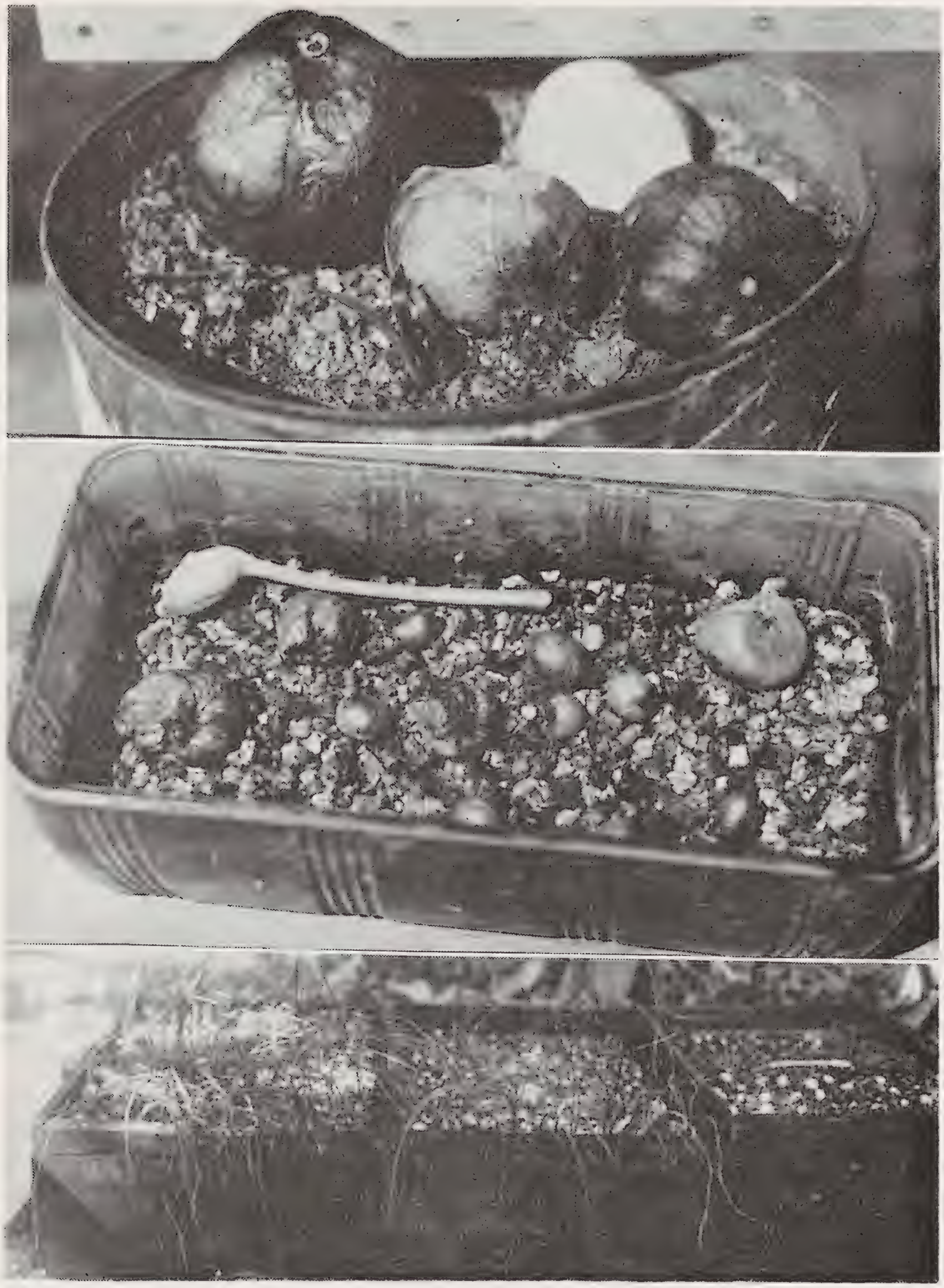


Fig. 20. Top, *Crinum yemenense* seeds up to 2 inches in diam.; seed in foreground has produced two sprouts. Center, germination of difficult *Crinum* seeds on moist vermiculite in covered dish. Bottom, deep redwood seed flats used for bulk planting of large seeds like *Crinum*.

Acid peat or sawdust should never be used. Occasionally ground limestone is added to keep the soil from turning acid if much organic matter is present. This planting soil is placed in redwood planting boxes, size 12 x 24 inches by 6 inches deep. These boxes are carefully painted inside and out with a copper naphthalate fungicidal paint (available from Fullers Paint Co.) some days before the planting soil is added.

This treatment insures no loss of the planting box due to decay for at least 8 or 10 years. Five inches of planting soil is added, well soaked, then the seeds are scattered across the top about an inch apart, and a glass plate is set over the entire box. This glass plate holds the moisture and keeps the slugs or snails from paying a visit.

In some instances stubborn *Crinum* seed or tempermental *Nerine* seeds are ''pre-germinated'' on moist vermiculite (Fig. 20) in a sealed glass or plastic food dish. These seed are usually planted after the radicles are well established, but *Nerine bowdenii* has remained in such containers for a year before transplanting the well established bulblets.

The seed flats in turn are usually left covered with the glass until all of the seeds have become fully established and foliage is three inches or more long. Stamped metal labels are nailed to all but the *Crinum* flats since the *Nerine* or *Brunsvigia* hybrids may remain in these flats for five or six years until transplanted. *Crinum* and x *Crinodonna* usually become too crowded if left in a flat for more than six months, so these plants are nominally planted out in beds the following spring, but *Brunsvigia rosea* or *B. x multiflora* bulbs take five or six years to size up to a hens egg diameter before they become crowded. Sometimes *Nerine* seedlings are not transplanted until the bulbs begin to flower.

Brunsvigia and *Nerine* bulbs are usually transplanted from the flats in September. A minimum of roots are disturbed in this operation in order to not retard bulb growth. The simplest way to effect this is to soak the entire flat in water and wash the soil free from the plants, then gently shake the bulb mass to segregate the entangled roots. The bulblets are planted in rows with a six-inch spacing between bulblets. The bulb base is set about 2½" below the normal surface. This shallow planting encourages better multiplication and earlier than normal first flowering, which may occur from the sixth to tenth year. Poorly colored or shaped flowering plants are promptly rogued out as soon as the initial blossom is fully expanded. Top grade material is marked for further observations, or even transplanted into a special bed. By soaking the bulb heavily and lifting all of the root mass no harm occurs with a quick transplant during the flowering period. No setback will occur if the roots do not became dry. However, if bulbs of *B. rosea* or *B.* x *multiflora* are permitted to become dry, the flowering cycle is upset for two years at least.

Normal transplanting of flowering bulbs should occur during late June or very early July. This will permit the bulbs to recover from the shock of root exposure and to initiate the flowering bud for the following year. However, some bulbs are prone to skip a year on the slightest provocation, and others do so naturally, so even the best gardeners miss a few blossoms until large bulb clumps are formed.

This tendency to skip flowering, plus the slow development of some seedling bulbs makes it impossible to evaluate a seedling bed completely until the tenth or eleventh year has passed. By that time it is assumed that the best forms have been placed in special beds, and the worst have migrated to the trash heap, so the remaining bulbs are passed around to non critical home gardeners or church raffles. At their worst these are far superior to the old Cape Belladonna, *B. rosea* var. *major* of California gardens, and at best they are still surpassed by a great many top class and recently named clones, but they are still good garden material.

Summer resting bulbs can tolerate light watering during the midsummer previously to flowering, but heavy soakings are to be avoided. The writer has set up the hypothesis for further testing that the immature flower bud may be crushed by the sudden swelling of the immature foliage when bulbs are heavily watered. The writer usually withholds water until August 20th, then turns a light spray on for an hour or so. This practice brings all of the flowering buds up at once with the exception of some very late flowering Multiflora hybrids. The same treatment is used on *Nerine,* only with a month or six weeks delay. *Nerine* seldom produce scapes earlier than Sept. 15th, and they should not be rushed—the later the heavier watering the more flower scapes are obtained.

Some *Nerine* and *Crinum* are apparently subject to a form of chlorosis, but in the writers experience this is due to the loss of roots due to peat, acid soil, or late fall transplanting. This chlorosis may be a nitrogen deficiency within the bulb and might be eliminated by a spray of "New Green" or other soluble urea fertilizers. Those who are troubled with this disease should try this treatment, and report in HERBERTIA.

More bulbs can be lost by adverse culture or climatic conditions than due to disease or insects. Bulb rot will occur with some of the Cape Amaryllids if they either are chilled for too long a period in winter, or are left in a hot greenhouse during the summer. The *Narcissus* bulb fly which bothers a number of the central American amaryllids will rarely touch Cape bulbs. *Crinum* have been found infected on several occasions, but in each instance root disturbances have been noted and the rotting tissue had attracted both the bulb mite and *Narcissus* bulb fly.

The berry stem nematode which is related to the *Narcissus* stem nematode will attack both *B. rosea* and daffodils, but where this nematode will eliminate the daffodils, the *B. rosea* will clear themselves from the trouble in two or three years, particularly if the dry foliage is cleared away with the lesions which contain dormant nematodes.

ADDITIONAL TETRAPLOID HEMEROCALLIS CLONES

The following additional colchicine-induced *Hemerocallis* clones are hereby listed for the record—'Tetra George Gilmer' (Traub, 1959), saffron yellow; 'Tetra Neyron Rose' (Traub, 1959), pastel pink; 'Tetra Flirtation Pink' (Traub, 1959), pastel pink; 'Tetra Capri' (Traub, 1959), yellow blend; 'Tetra Junipero Serra' (Traub, 1959), yellow blend; 'Tetra Blue Danube' (Traub, 1959), pastel purplish; 'Tetra Dorothy McDade' (Traub, 1959), late light yellow; 'Tetra Charmaine' (Traub, 1959), pastel pink; 'Tetra Butterfly' (Traub, 1959), light yellow; 'Tetra Citation' (Traub, 1959), medium red; 'Tetra Salmon Sheen' (Traub, 1959), pastel salmon; 'Tetra Maid Marion' (Traub, 1959); pastel pink; 'Tetra Evelyn Claar' (Traub, 1959), pastel pink; 'Tetra Pink Prelude' (Traub, 1959), pastel pink.—*Hamilton P. Traub*

AMARYLLIS PRODUCTION IN HOLLAND

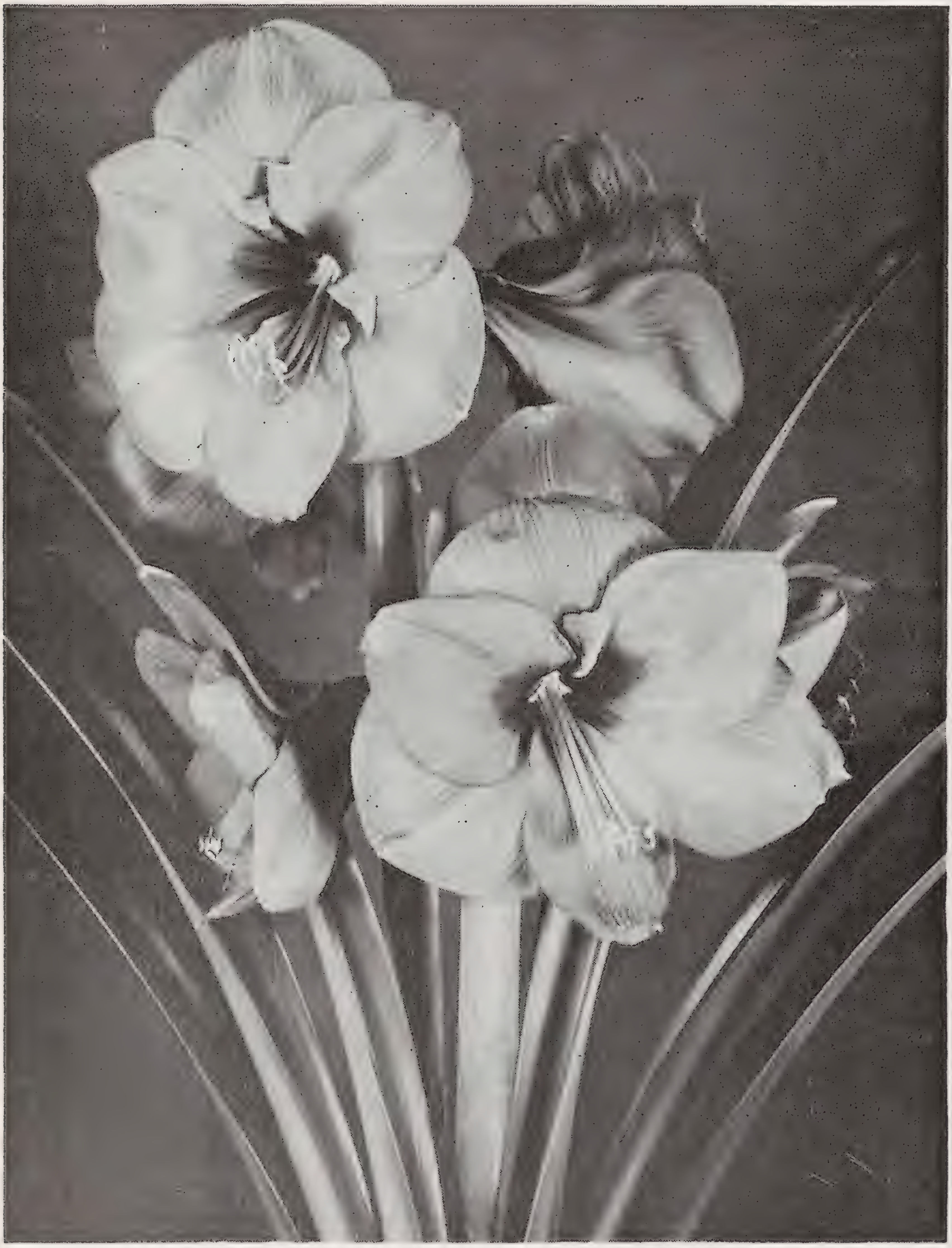
CLAUDE W. DAVIS, *Louisiana*

Commercial production of the Dutch hybrid *Amaryllis* is in the northwestern part of Holland within the triangular area formed by the cities of Den Haag (The Hague), Haarlem and Amsterdam. All propagation and growth of the bulbs is in steam heated greenhouses for the entire year. Approximately a quarter of a million bulbs are produced annually for the export trade. Most of the commercial production is by four large firms. These are Ludwig & Company, Hillegom; G. C. van Meeuwen & Zonen, Heemstede; W. S. Warmenhoven ''Zonnewende'', Hillegom and W. Warmenhoven & Zonen, Hillegom.

The firm of Ludwig & Company was originally founded by two brothers, Ernest and Casper Ludwig, in 1892. The first stock of bulbs consisted of the then relatively new Amaryllis Leopoldii hybrids, purchased from Robert P. Ker & Son, Liverpool, England. The firm, along with the name was sold to Van Til-Hartman, Ltd., Hillegom, Holland on Jan. 15, 1940. With the end of World War II, Ludwig & Company was changed into a limited liability company. The shares were divided as follows: two thirds to Mrs. C. J. van Til, one sixth to Mr. C. J. van Til and one sixth to Mr. A. Jansen. Mr. Van Til and Mr. Jansen are the managing directors of Ludwig & Company, Ltd. In addition, Mr. C. J. van Til is one of the managing directors of the parent firm, Van Til-Hartman, Ltd. Mr. Jansen (Fig. 21) is in charge of breeding and production for the Ludwig firm. In charge of sales and public relations is Mr. H. J. N. van Woesik, who is an employee of Van Til-Hartman, Ltd., but who sells *Amaryllis* for Ludwig & Company on a commission basis. The first illustrated, retail catalog was published in 1950. The sales office and plant breeding establishment is located at Hillegom, but the commercial production is some distance away at Aalsmeer, Holland, the seat of what is probably the world's largest market for the florist trade. Ludwig & Company now have an annual production of approximately 50,000 bulbs for the commercial trade, but they are expanding their facilities for an anticipated production of 100,000 bulbs for sale annually. Exports to America are made three times a year in pool shipments to New York for distribution from that point. The first pool shipment is made in November, the second in early January and the last in late February.

In 1958 Ludwig & Company offered 53 varieties of the large hybrids and three varieties of the miniature ''Gracilis'' for sale. A few of the best known of the Ludwig varieties are 'Doris Lilian', 'Pink Favorite', 'Pink Perfection', 'Miss Margaret Truman', 'Nivalis', 'White Giant', 'Ludwig's Dazzler', 'Snow Queen', 'Wyndham Hayward', 'Bouquet', 'Salmon Joy', 'Ludwig's Scarlet', 'Halley' and 'Apple Blossom'. An unusual and distinctive introduction in 1958 is 'Picotee', which is pure white with a clearly defined red edge.

The Royal Nurseries, G. C. van Meeuwen & Zonen N. V., located at Heemstede, is an affiliate of H. De Graff & Zonen N. V., Lisse, Holland,



Typical Van Meeuwen hybrid *Amaryllis.* Note excellent form; also the tepaloids at the base of the tepalsegs.
Plate 6a

with both firms having as director-owners Mr. B. J. C. Vandernat and Mr. G. Mastenbroek. The hybrids developed by this firm are known as "Van Meeuwen's Superiora" (Plate 6a) and are being sold under the registered trade name of "PARADISE" *Amaryllis.* The sales agency in America is H. De Graff & Sons, Inc., 11 East 44th Street, New York 17, N. Y. The founder of the Van Meeuwen firm was G. C. van Meeuwen in the year 1856. It was purchased, including the name, by De Graff &

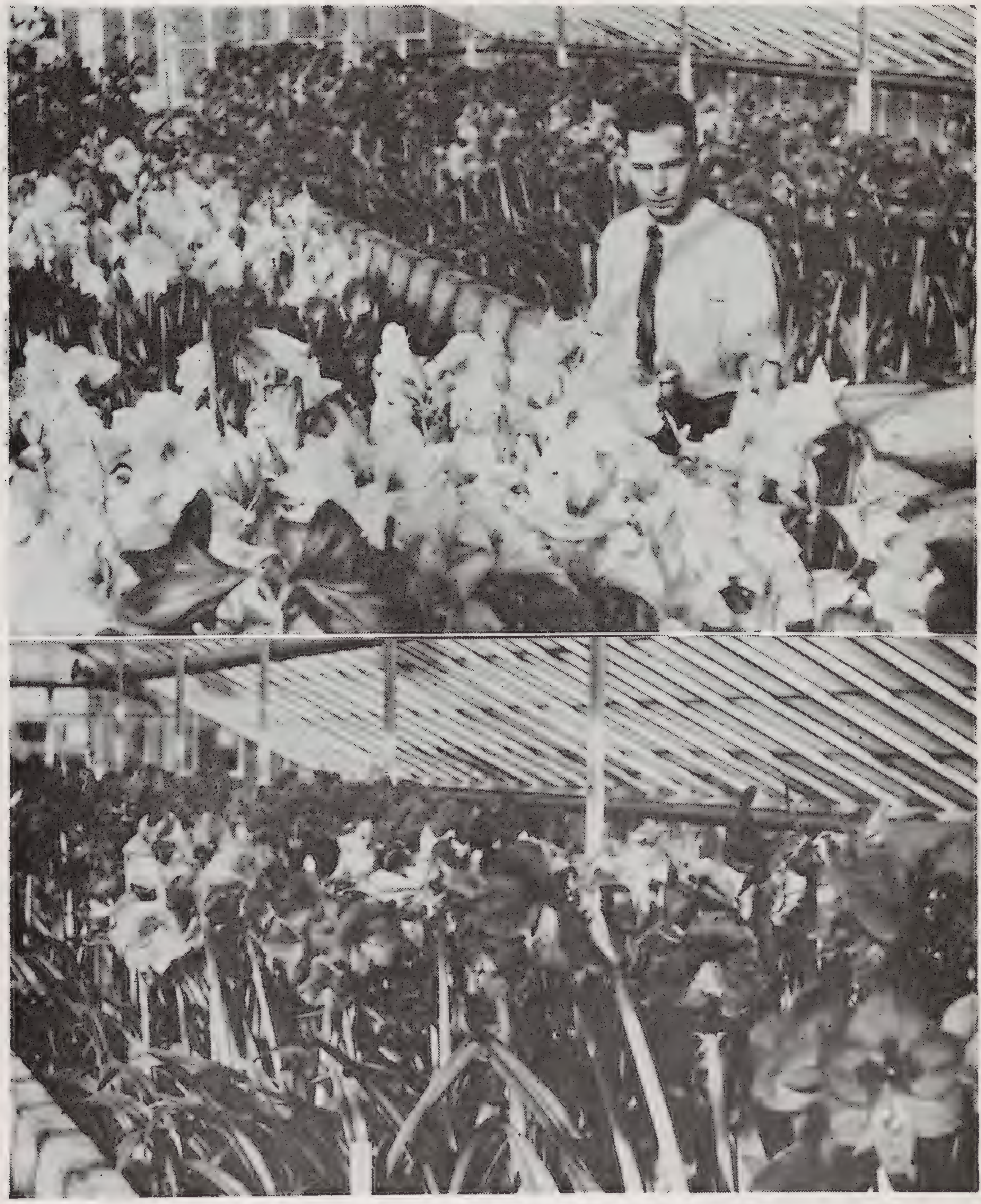


Fig. 21. Typical Ludwig & Co., hybrid *Amaryllis;* note excellent form. Top, Mr. Jansen among his choice hybrids. Bottom, typical greenhouse culture.

Zonen in 1921. The annual production of the *Amaryllis* grown in a large range of greenhouses covering 200,000 square feet of glass is exported largely to the Eastern Seaboard, the Middle West and the South in the United States.

Van Meeuwen offers two forms of *Amaryllis* in both standard varieties and by color. These are the early flowering, prepared bulbs and the regular, or late flowering bulbs. Prepared bulbs, known as ''Herald'' *Amaryllis* are sold in October for flowering at Christmas time. The regular, or unprepared bulbs are exported in November for flowering in February and later. In the 1959 catalog this firm offers 22 named varieties available in large quantities for the wholesale trade. In addition, they grow a large number of outstanding new varieties not yet introduced. A few of the best known of the Van Meeuwen varieties are 'Alcyone', 'Queen Superiora', 'Superba', 'Faust', 'Julia', 'Albino', 'Tristan' and 'Giant Goliath.'

The entire foundation stock of the ''Original Gracilis'' is owned by Van Meeuwen, having been purchased from the originator, Mr. H. Boegschoten, head gardener to Mr. J. C. Bunge, a leading industrialist in Holland. This small flowered, or Graceful strain was developed after twenty-five years of cross-breeding and selection, using as parents the medium flowered species, *Amaryllis striata* and the large flowered hybrid strains. These intermediate flowers are almost an exact duplicate of the larger hybrids, but with long, *slender* stems which makes them excellent for use in flower arrangements.

The firm of W. Warmenhoven & Zonen was founded by the former Willem Warmenhoven in the year 1860. He was succeeded by a son, Cornelis Warmenhoven, who died in 1936, leaving three sons. The eldest son, Willem S. Warmenhoven started a business of his own in 1923 and was the first commercial grower to use vegetative propagation of Amaryllis, beginning in 1925. He does business under the name, W. S. Warmenhoven ''Zonnewende'', Hillegom. The two other sons of the late Cornelis Warmenhoven are Simon Warmenhoven and Cornelis Warmenhoven, who jointly carry on the firm of W. Warmenhoven & Zonen, organized by their grandfather Willem. These two Warmenhoven firms produce annually more than 100,000 bulbs for export.

The firm of W. S. Warmenhoven ''Zonnewende'' Hillegom sells bulbs under the name, ''ROYAL DUTCH AMARYLLIS'', both in named varieties and by color. These are available in the prepared bulbs for early flowering and the regular bulbs for later flowering. All sales are wholesale, with a minimum order of 50 bulbs and on an ex-warehouse basis in Holland. The sales are handled exclusively by P. J. Komen, Anna Paulowna, Holland.

W. Warmenhoven & Zonen sells its entire product to exporters in Holland. Two of these are J. J. Grullemans & Sons, N. V., Lisse, Holland, and A. Frylink & Sons N. V., Sassenheim, Holland.

Some of the popular Warmenhoven ROYAL DUTCH AMARYLLIS are 'Leading Lady', 'Joan of Arc', 'Queen of the Whites', 'Red Master', 'Sweet Seventeen', 'Bordeaux', 'Anna Paulowna', 'Queen's Page', 'King of Stripes', 'Violetta', (Fig. 22) 'Scarlet Triumph', 'Lucifer', 'Morena', 'Mount Tacoma', 'Beacon', 'Royal Ruby', 'Red Majesty', 'Cherokee', and 'Christmas Joy'. The latter is a intermediate, early flowering orange red which blooms in three to four weeks and can easily be in full flower by Christmas time.

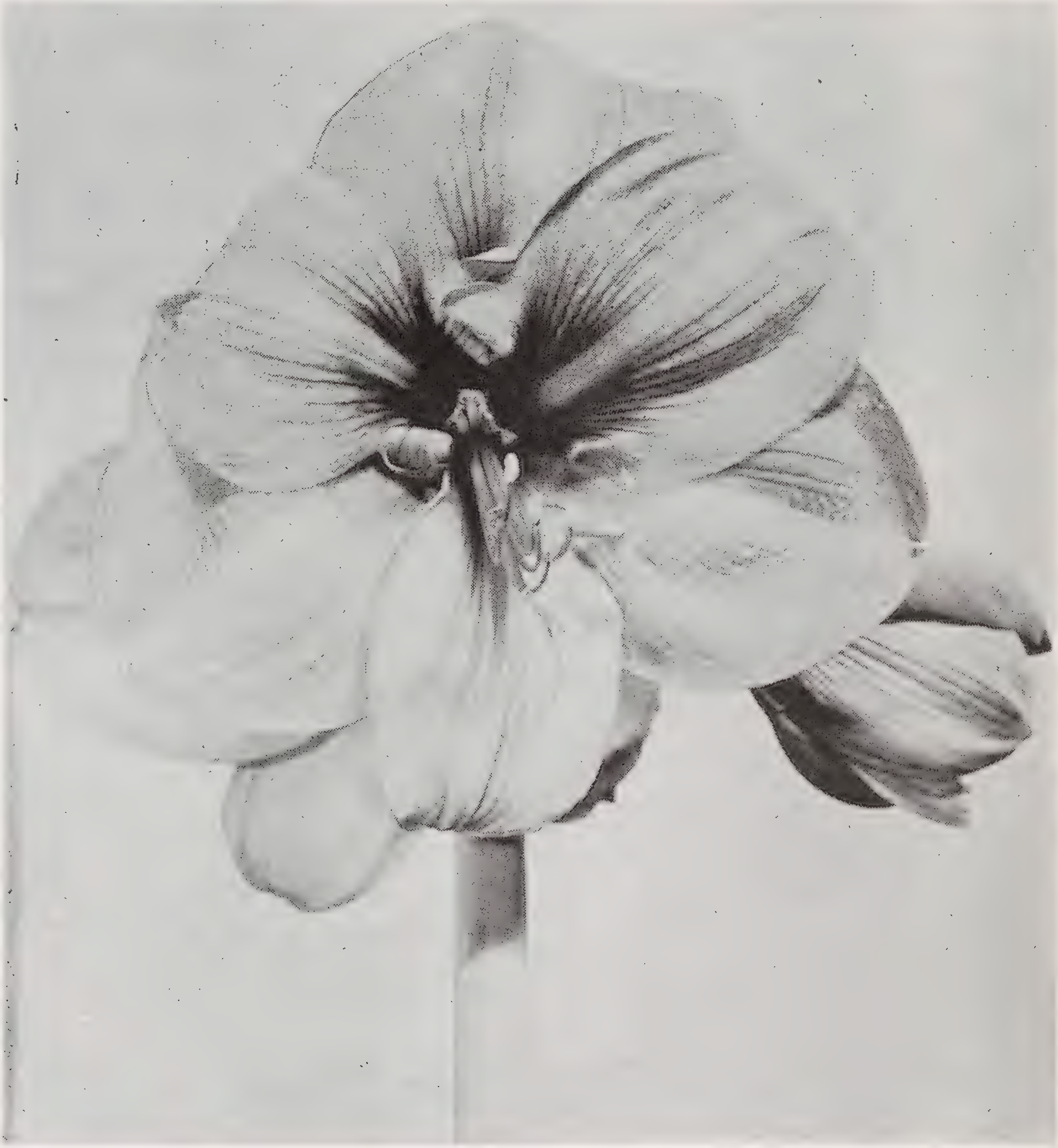


Fig. 22. Typical W. S. Warmenhoven hybrid *Amaryllis*—clone 'Violetta', violet-hued to lavender-rose. Note excellent form. Photo by Wyndham Hayward.

Vegetative propagation of the named clones is by one or the other of the two methods now available. The first was introduced by Miss Ida Luyten (now Mrs. Oliver) in the 1920's at the Laboratory for Plant Physiological Research, Wageningen, Holland. According to this method, the *bulb scales* are utilized. The other method was introduced by Dr. Hamilton P. Traub and Mr. I. W. Heaton in Florida in the 1930's. In this method fractional scale-stem cuttings are made. These two methods are described in detail in Dr. Traub's new book, "The Amaryllis Manual".

Usually, the bulbs are cut in December and January and bedded in pure sand. During the winter months the temperature of the bed is kept at 60 to 68 degrees F. at bulb level and during the summer at 70 to 77 degrees F. The following fall the small rooted bulbs, which formed on the cut segments of the mother bulb, are transplanted to beds where they are grown for three years to produce commercial bulbs. The No. 1 bulbs are 26 to 28 centimeters in circumference and top size bulbs are 28 cm. and up in circumference.

Of especial interest to American *Amaryllis* fanciers is the fact that the commercial bulbs are grown in pure compost, containing about 10% sharp sand by weight. This compost is made from leaves, manure and straw bedding from the stalls, all of which has been allowed to decompose for a year or more, or until it is almost completely reduced. The ratio of leaves to manure and straw bedding is dependent on the availability of the latter, but it usually is about three parts of leaves to one part manure and bedding. During the summer months the bulbs are watered daily by having the water sprayed on the beds. Commercial fertilizer containing nitrogen, phosphoric acid and potash is used in one or more applications by some growers. The soil reaction is kept at neutral (pH 7) or nearly so, and an effort is made to prevent it from dropping below pH 6. Intensity of sunlight is broken by spraying the inside of the greenhouses with a lime wash several times a year, or as often as may be needed. At the end of three years growth the bulbs are dried off and harvested in October. Some of the growers then completely remove all of the compost and replace it with fresh material. Others add an additional amount to the old beds to replace losses through oxidation, after which the beds are sterilized with live steam before planting again with small bulblets for another three years of growth.

The writer visited the *Amaryllis* greenhouses in late July, 1958 and was amazed to find that the beds with 2½-year old bulbs were completely filled with a mass of matted roots and the top growth of the leaves was from three to four feet high.

In the collection of material for this article, the writer gratefully acknowledges assistance from the following individuals in Holland: Mr. H. J. N. van Woesik of Ludwig & Company; Mr. M. Vandernat of G. C. van Meuween & Zonen N. V.; Mr. Cornelis Warmenhoven of W. Warmenhoven & Zonen; Mr. Willem S. Warmenhoven of W. S. Warmenhoven "Zonnewende" Hillegom; Mr. P. J. Komen, Bulb Grower, Anna Paulowna, Holland; and Mrs. Ida Luyten Oliver of the Laboratorium Voor Plantenphysiologisch Onderzoek.

Miss Luyten* has published the following instructions for potting: In our country *Amaryllis* "culture is always a hothouse-culture. The bulbs are planted in the bed either free or in pots. We always raise them in pots. After the resting period they are repotted; at the bottom a potsherd is placed for good drainage. The roots are spared. As potting soil 1/3 part peat dust, 1/3 part old decomposed cowdung and 1/3 part garden soil is taken while for each m^3 soil 10 kg Thomas papslack** is added. 2/3 of the bulb is above the soil of the pot, each bulb is surrounded with old cowdung. After this they are dug into the bedding in nutritive soil to enable the bulbs, planted in pots, to enlarge their root-system. In this embedding care is taken that the neck too is below the level of the soil, which prevents the settling of the mealy bug between the upper part of the scales. During each period of growth 5 times a gift of fertilizer is added viz. 2 kg superphosphate, 1½ kg magnesiumpotassium sulphate and 1 kg ammonium sulphate for each 10 m^2. Much air, light and moisture is needed. A few times each day water has to be squirted between the leaves as soon as the leaves have reached a certain length. ———— In our experiments the air in the hothouse varied from 17 to 24 degrees C. (62 - 77 F.) in winter; from 20 to 27 degrees C. (68 - 80 F.) in April until August."

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* Mededeeling No. 70
Laboratium Voor Plantenphysiologisch Onderzoek, Wageningen, Nederland.

GROWING AMARYLLIS FROM SEEDS

Mrs. J. V. Hoyt, *Texas*

I have always had a special love for the large and beautiful hybrid *Amaryllis,* but not until I started growing them from seeds did they become a special hobby with me.

I had learned from earlier trials that better germination of seeds is obtained when they are planted soon after they mature in this humid climate. I have also learned that *Amaryllis* seedlings respond better to a rich soil mixture. I now plant the seeds in a sterilized mixture almost as rich as the potting soil that I use for mature bulbs. Peat moss is also added, and a little lime to offset the acidity of the peat moss. Each flat is filled almost full of the mixture, and they are then set in shallow water to soak thoroughly. Then they are drained. I make indentations with the finger about an inch apart over the surface, and place a fat seed in each place and cover lightly with the same soil mixture, pressing down gently. I have found that it is not necessary to cover the flats with glass, especially when the flats are placed in the greenhouse. I water with a fine spray. The germination is excellent under these conditions, and when they are up I water heavily. Seedlings in flats are shown in Fig. 23.

I planted some of my 1956 seedlings in the garden in the spring and summer of 1957 and found that the ones in the flats with some peat moss had more roots. Hybrids grown outdoors are shown in Fig. 23.

The spring of 1958 was unusually frosty. I had bought a bale of hay and had mulched two beds of several hundred two-year old seedling hybrids. These were not damaged at all. However, it did damage the

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** 10 kilograms (about 22 pounds) of basic slag for each cubic meter of soil.

buds showing in my three-year old hybrid seedlings out in the open that were not mulched. Thus the outdoor show in the spring of 1958 was not up to expectations, but after the cold moderated, I had some fine blooms. A few were pink, and rose-colored, but the rest were mostly reds. One seedling produced self-colored soft pink flowers and this is a favorite. It came out of a cross of a large Dutch orange on a Dutch white. Thus the best ones are really worth waiting for.

I was surprised to have five two-year old Dutch seedling hybrids bloom in the beds that were mulched. Three were seedlings of 'Bouquet' and two of 'Salmon Joy'. They were fine blooms for the small two-year old bulbs.

With reference to breeding stock, I have found that it is better to use only the Dutch named stock if the large open-faced type flowers are wanted. I verified the statement I read somewhere that it is better to use bulbs with good root systems as seed parents. Plants which have not had time to make good root systems are used only as pollen parents.

My original breeding stock has been obtained mainly from Ludwig & Co. I had never seen a truly pink *Amaryllis* until the clone 'Daintiness' flowered for me. I am especially fond of the pinks and the pure whites. The bulbs when received are potted in a sterilized mixture containing soil, sand, compost, and manure with bone meal added. The potted plants are placed in the greenhouse and watered as needed. Soon buds appear, the bloom scapes shoot upwards. They usually flower in about eight weeks. The drama is fascinating to watch. As the buds are lowered, and grow larger, I am a constant spectator. Then the buds begin to unfold so swiftly before my almost unbelieving eyes. I am completely captivated.

I found that some clones set seeds better than others. It was also noted that the flowers fade quickly *after* pollen has been placed on the stigma. In order to enjoy the flowers to the last, I wait until the stigma is receptive (is pointed upwards) before pollinating.

My greenhouse and garden have their limitations. I am often reminded of my own limitations by sore muscles and fatigue. But when the urge stirs, I am up and at it. When the blooming season comes, I am well repaid for my hard work.

My problem now is to find room to plant all of this year's (1957) seedlings to make room in the greenhouse for the 1958 seed. Enthusiasm for a hobby is a wonderful thing. The rewards are rich in pleasure and enjoyment. However, I see that it can get out of hand. I wish I could plant every seedling and see the resulting flowers, but I do not have the space. I plan to make fewer and more select crosses next year. That is if I can restrain myself when the time comes and the urge says, "just one more."

After the above was written, Dr. Traub suggested that I write about my plastic greenhouse in which many others would be interested. There seems to be a movement among amateurs to favor themselves with small hobby greenhouses.

Like other gardeners, I had wanted a greenhouse for years, but budget considerations always interfered. In the summer of 1954, my husband mentioned that he wanted to provide for starting vegetable plants early in the season. Now, I thought, was a good time to get that greenhouse. A brooder house, 10 by 20 feet, no longer used, was torn down to the cement slab floor by my husband, and he made plans to build the framework with openings for removable windows on all sides and two venetian windows high up on each end.

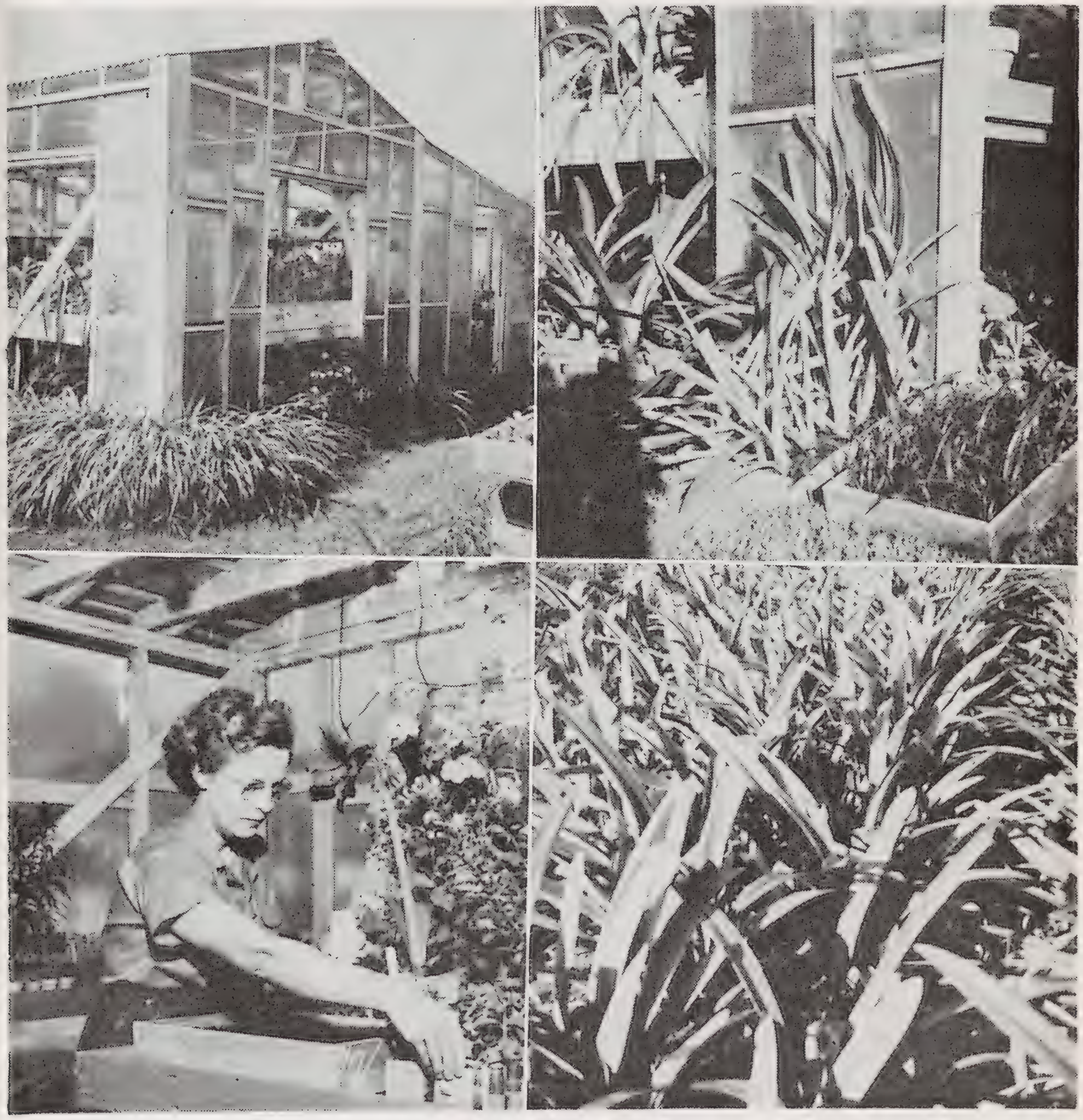


Fig. 23. Upper left, side view, Hoyt greenhouse, after enlargement.
Upper right, *Amaryllis* seedlings in flats; (to left) from 1957 seeds, transplanted and spaced fall 1958; (to right) from 1958 sown seeds.
Lower left, Mrs. Hoyt at work in greenhouse.
Lower right, *Amaryllis* seedlings in garden.

When this was completed, he built benches at a convenient height all around the inside, as wide as he could reach, to hold flats for vegetable seeds. Plastic film was purchased to cover the framework and windows. The woodwork was then painted.

The cement under the benches was covered to about six inches with sand for rooting cuttings.

The electric current was already there and he put in the electric lights. Then natural gas was piped in for heat, and water was obtained from the nearby well.

It worked like a charm. I began to neglect my housework for the more enjoyable greenhouse experiments. We liked it so much that we each kept adding new plant items until the house was no longer large enough. In 1956, he made an addition equal to the original unit, and changed the roof to heavy corrugated white plastic (fiberglas). The fiberglas is more expensive than glass but we believe that it is worth it. It allows light to come through that produces good germination and plant growth with good green color, yet is more durable than glass.

We leave the windows off when the weather is mild, but when a Texas ''norther'' blows up, we rush out and hook the windows on, and fasten them at the bottom, shut the door and all is secure until it warms up again. If it gets very cold, a small bathroom heater gives sufficient heat.

I admit that there are more flowers than vegetable plants grown in the greenhouse. However, when January comes room is made for vegetable plants.

I don't know how we ever got along without the greenhouse during the previous years. Of course, it is a lot of work, but when one is doing something in which one is interested, one does not seem to mind the amount of work. The best result is that my husband is more interested in flowers and is now almost as ardent an *Amaryllis* enthusiast as I am.

SUMMER CARE OF AMARYLLIS

W. J. Perrin, *Recording Secretary,*
Men's Amaryllis Club of New Orleans

Mrs. Perrin and myself are members of two local garden clubs which hold *Amaryllis* shows and are actively engaged in the advancement of these fine plants in our City. Mrs. Perrin is now President of the Garden Circle.

When January 15th comes along each year, we start working on our bulbs, making every effort to force them into bloom at their best for the show dates, which are usually during the latter part of March. This requires intensive forcing procedures and as a consequence, the bulbs shrink. This shrinkage prompted me to experiment with the half-shade lath covering in the summer care of *Amaryllis.*

At present we have sixty imported named Dutch hybrid clones, and endless numbers of our own hybrid seedlings, and also Meade strain hybrids. All named Dutch clones are planted in pots; the others in well-drained beds in various locations in our yard.

Prior to 1957, we had very little success in bringing our bulbs back to size during the growing season. In the early spring of 1957, we made up a bed 16 feet long by 4 feet wide, using second hand concrete blocks as a border. These blocks are about 8 inches high, and were set on the ground level. We then made up a light cypress frame with a gabled roof, 4½ feet high at the center. Old plaster laths were then nailed over the top of the frame with one lath-width space openings between

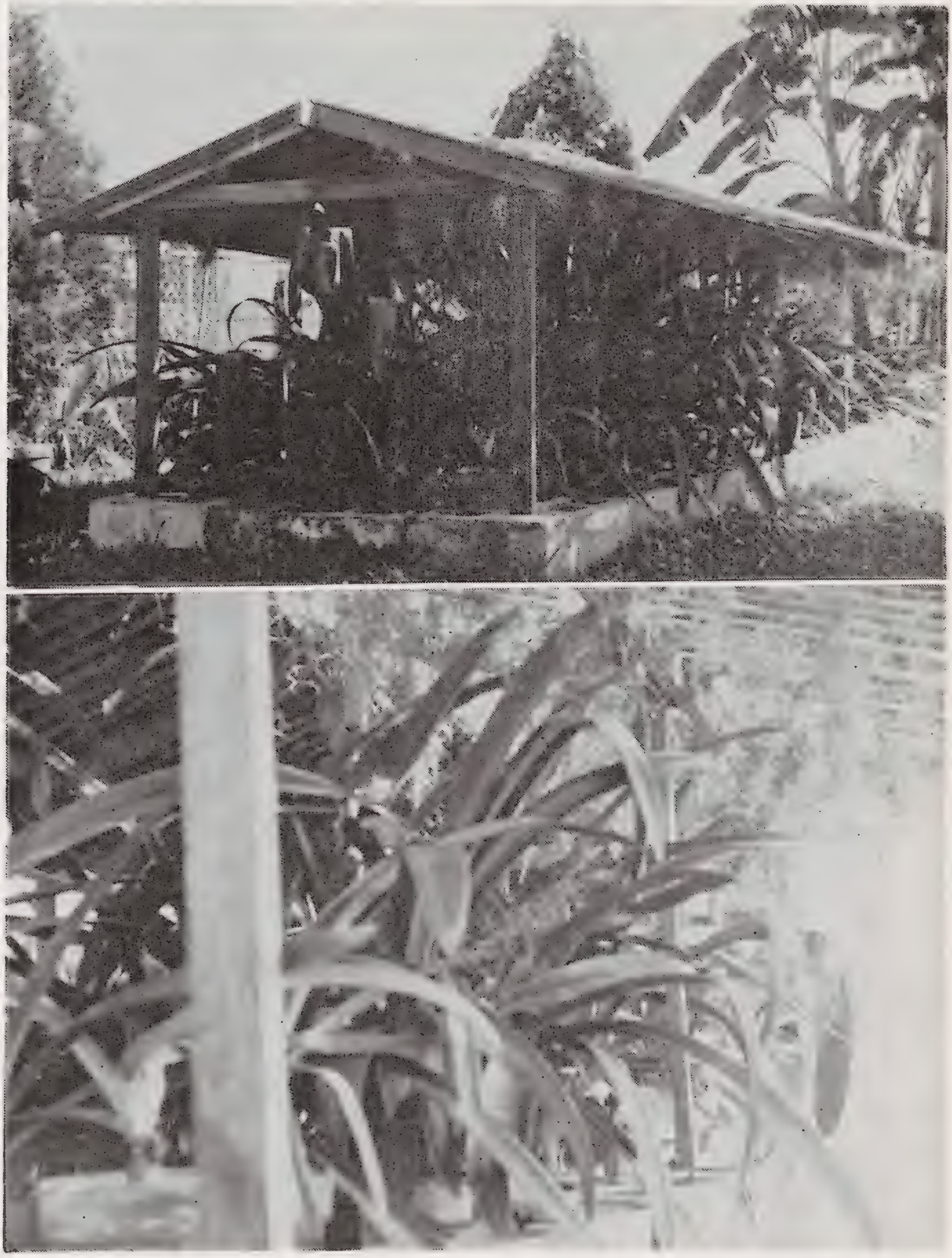


Fig. 24. Upper, showing lath half-shade for summer care of *Amaryllis*. Lower, close up, showing roof at right with Spanish moss used to cut down light still more; and roof at left, covered with laminated paper put on Oct. 1 to start withholding rain water. See text for further details. Photo by W. J. Perrin.

the strips, giving a half-shaded area underneath. The laths extend over the frame for 18 inches on the sides, giving the plants protection from direct sun for about 2/3 of the day. All pots are sunk in peat moss with the rims showing. See Fig. 24.

We use an extra light, well-aerated soil, made up of humus, rotted cow manure and vermiculite. Potted plants are protected from severe cold weather. Bone meal and ''Cross Country Fertilizer'' are used.

That this lath covering works very well is shown by the results—about 90% of last year's forced bulbs have come back to normal size or better.

NOTES ON AMARYLLIS AGLAIAE

Joseph C. Smith, *M.D.*

Great excitement abounded in the greenhouse of the writer late in April 1958 when the first buds of *Amaryllis aglaiae* opened. At last the suspense was broken, and the first flowering of amaryllis aglaiae in the United States was at hand. Although the foliage had looked quite different, the five years from seeds to flowering had allowed the question to expand as to whether this would really be a new color or just another red amaryllis. Now, with a gleaming yellow flower with no trace of red as proof there could no longer be any doubt as to the identity, and that there really existed pure yellow in the genus *Amaryllis.*

Dr. Traub had obtained seeds of *Amaryllis aglaiae* from Dr. Castellanos in 1953. He distributed seedlings to various members including the writer.

Amaryllis aglaiae was first described in 1940 by Dr. Alberto Castellanos of Argentina. Its native habitat is the provinces of Tucuman, Salta, and Juyuy in the northwest corner of that country where it joins Bolivia. There it grows in quantity in the open fields and is an important part of the flora of this region where it is known as ''The Great Amancay''. This is a term that distinguishes it from other smaller yellow flowered liliaceous plants.

The word *agaliae* is derived from the name of the Greek goddess Aglaia, the goddess of grace, of the trio of beautiful goddesses of the graces, Aglaia, Thalia, Euphorsyne (grace, beauty, and joy). And, indeed, this is a graceful amaryllis both in flower form and in its natural miniature stature. The color of this species is a rich butter yellow which shades into green in the throat. There is nothing like it in hybrid *Amaryllis* colors, and this elegant shade of yellow should be carried over into the large hybrids as soon as possible. Some difficulty may be encountered here as the first flower of *A. aglaiae* did not cross with the hybrids or set seed to its own pollen. When it becomes possible to cross-pollinate between seedlings seeds should be obtainable as this species is reported to be fertile.

The culture of *A. aglaiae* has not been difficult. It responds well to heat and fertilizing and has been grown successfully both in the greenhouse and in the open ground here in southern California. Good drainage and a liberal amount of humus seem to be the main soil requirements. It was reported to be evergreen, but in the open ground here it has gone dormant in the late fall and remained below ground until the soil is warmed sufficiently to start growth in the spring, usually about

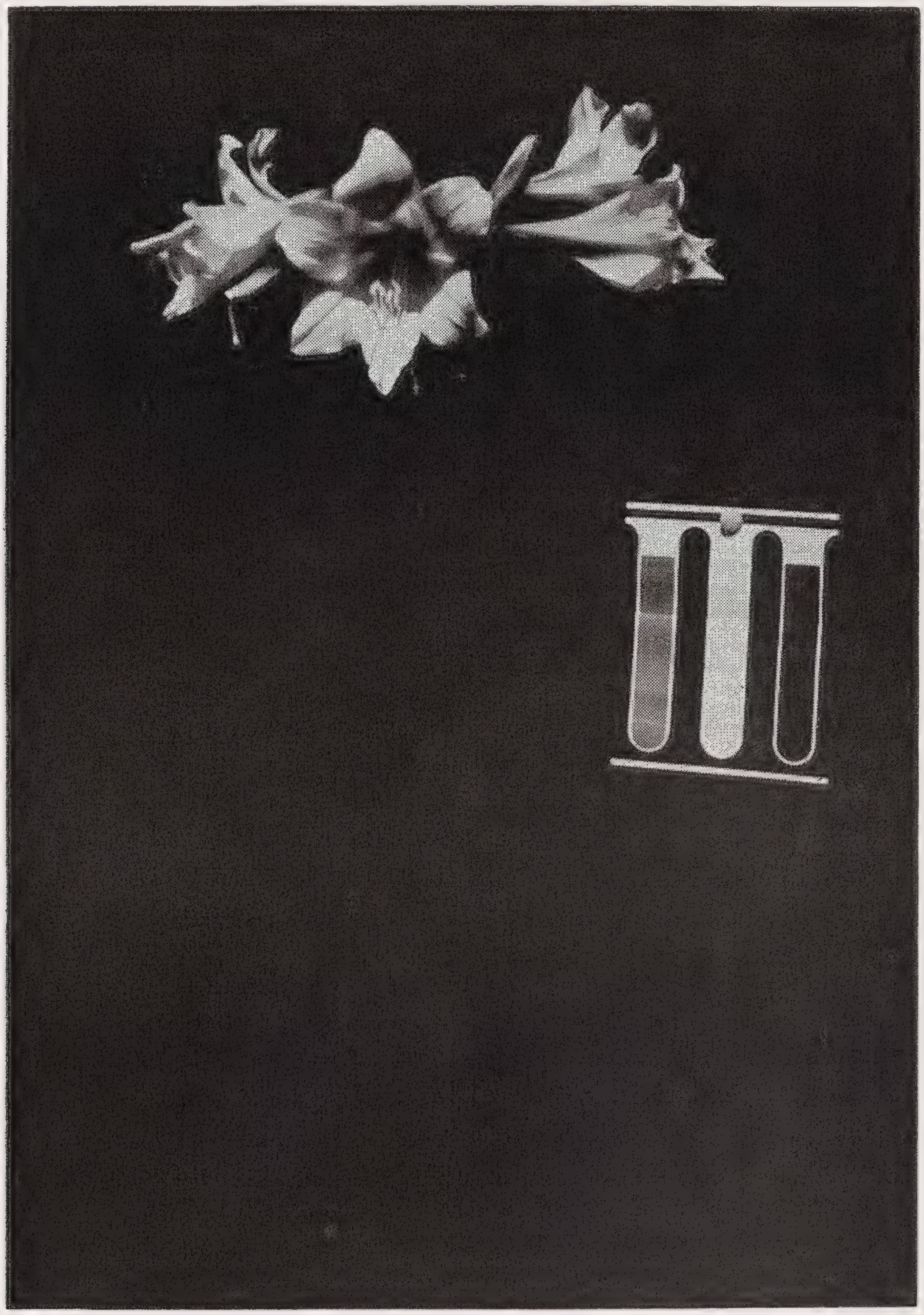


Fig. 25. Amaryllis aglaiae with 6-flowered umbel; grown by Dr. Joseph C. Smith of La Mesa, California. Reproduced from Kodachrome transparency; this accounts for lack of visibility of leaves just sprouted and the scape.

April 1st. In the greenhouse the bulbs will grow continuously if sufficient heat is applied. Then, they send up a new set of leaves about every third month, and a vigorously growing bulb may have as many as twelve to fifteen leaves at a time, the oldest set gradually dying off as the newest set is emerging. Offsets are made fairly rapidly when bulbs are growing well. The cuttage method of propagation has not been tried as yet due to the limited stock since the writer started out in 1955 with only three seedlings.

A few variations from the official description as given in Traub and Moldenke's Amaryllidaceae: Tribe Amaryllae (1949) should be noted although these may be only seedling variations. Of particular interest is the fact that the first bulb to flower carried six florets to the umbel (Fig. 25). The pedicels varied from 20 to 45 mm in length at anthesis. The ovary was a deeper green than any other part of the plant. The tepaltube was 7 mm long. The tepalsegs were not paler on the margin and were even a deeper shade on the reverse side. The tips were more rounded than the standard. Setepelsegs were 7.2 cm by 3.1 cm. and the petepelsegs were 7.2 cm by 2.5 cm, the lower one only 2.0 cm in width. Anthers were pale yellow in color and 15 mm in length.

This is a wonderful little *Amaryllis* and will no doubt be very popular when the supply of stock is sufficient for commercial distribution to the public. It should be hybridized by crossing with the other amaryllis with yellow coloring such as *Amaryllis evansiae* which is also of small stature and *Amaryllis calyptrata* of the larger species. These crosses could give yellow hybrids without resorting to the red hybrids since red is the dominant color and would probably require as long to breed out as it did the green from the red series.

EXPERIENCES WITH HYMENOCALLIS

C. L. Burlingham, *Florida*

I settled in Punta Gorda, in 1940, one hundred miles south of Tampa, on the Gulf coast. When walking along the streets I often encountered clumps of what I later learned were *Hymenocallis*. One day, alongside a sidewalk, I picked up a few seeds, looking somewhat like small green olives. I put them in a saucer in my bedroom, as the most convenient place at the time, vaguely thinking that some day I would plant them somewhere. In two or three weeks I was astonished to see that the seeds were sprouting in the saucer.

There is a wild species, not yet identified, growing here in the fields. In the fields I have never seen but one scape and one flower at a time. but brought into cultivation the bulb is likely to have two or three flowers to the scape. The flowers are much smaller than the sort cultivated here. They blossom from May first into October. This year the last blossom I happened to see was on October tenth.

The cultivated species, so often found in clumps in houseyards here, has been identified as *Hymenocallis littoralis*. It has a much larger flower, and a fragrance somewhat reminiscent of the rose. I have counted as many as sixteen buds on one scape, but one seldom sees more than three or four open flowers on a scape at one time, and the buds may open over a period of weeks. The bulb grows amazingly well in our sandy soil without fertilizer or other attention, and is prolific in making seeds and offsets.

One bulb in the course of time becomes a clump, sometimes six feet in diameter, and one seldom sees them here except in clumps, and they are almost always grown here in the full sun. It begins blooming the first week in May and blossoms all Summer. It is of interest to find out how late they bloom. This year I visited some dozen clumps near the sidewalk in as many home gardens—every two or three days—beginning September 25th. By that date some clumps had already stopped flowering. The remaining seven clumps dropped out of the race from time to time until on October eighth the last flowers I could find were three flowers on two scapes in one clump. However, this year our daily maximum temperature did not drop below 90 until October ninth, a week later than usual.

In the fields my attention is called to a *Hymenocallis* only when I see it in blossom, and I never know whether or not I have seen that particular specimen before. *Hymenocallis littoralis* is seldom seen except in clumps, and one has no idea how many scapes are produced by a single bulb of either species in a season.

NOTES ON HYMENOCALLIS X FESTALIS

Philip G. Corliss, *M.D.,*
Somerton, Arizona

In the difficult (hot, dry, alkaline) climate of southwestern Arizona, the clone sold as *Hymenocallis* x *festalis,* displays remarkable 'hybrid vigor'. I have tried to grow many of the ismenes and their close relatives, and this hybrid far out-performs any of them. Its only rival, and not a close one, at that, is the lovely *Pancratium maritimum.*

H. x *festalis* was introduced to Yuma gardens by one of the most capable women gardeners of Somerton, who paid $7.50 for her first bulb. She divided it with many friends, including the writer. I have further distributed it, donating several dozen large bulbs to a church auction, and giving and selling bulbs to many local gardeners. I wish I could sell all I am now supporting for $7.50 each! In a few years after division each bulb becomes an enormous clump whose leaves, if well fed and watered, exceed five feet in length and arch in a diameter of eight feet or more, eventually draping themselves untidily over everything within reach.

Depending on the amount of shade, water, and weather, these clumps bloom from late spring to early fall, the massive white chalice-shaped flowers rising to height or just above that of the foliage. They are surely the most striking flowers of the garden during the months of over one hundred degree heat; their foliage stays bright and glossy throughout the year, but is at its best in the hottest weather.

There is but one serious pest, up to this time, and it is the reason for this paper. It is the favorite food of the citrus mealy bug! (Fig. 26) Not until the plant is heavily infested with this pest does it leave for other fare. At present, I have perhaps a dozen clumps, or groups of clumps, of *H.* x *festalis.* Every clump will be infested before the mealy bug appears on other crinums, *Amaryllis,* or other plants and I have yet to find it on my citrus trees!

The citrus mealy bug looks grossly like so much cotton which has blown onto the foliage. Unlike the red spiders, it does not hide on the underside of the leaf, but prefers the upper surface. The full-grown bugs are perhaps one-third of an inch long and one-quarter of an inch wide and thick, but they are accompanied by bugs from that size down to microscopic speck-size individuals. Only the large bugs would be recognized grossly as an insect, and only these large ones show much movement, and that only if disturbed.

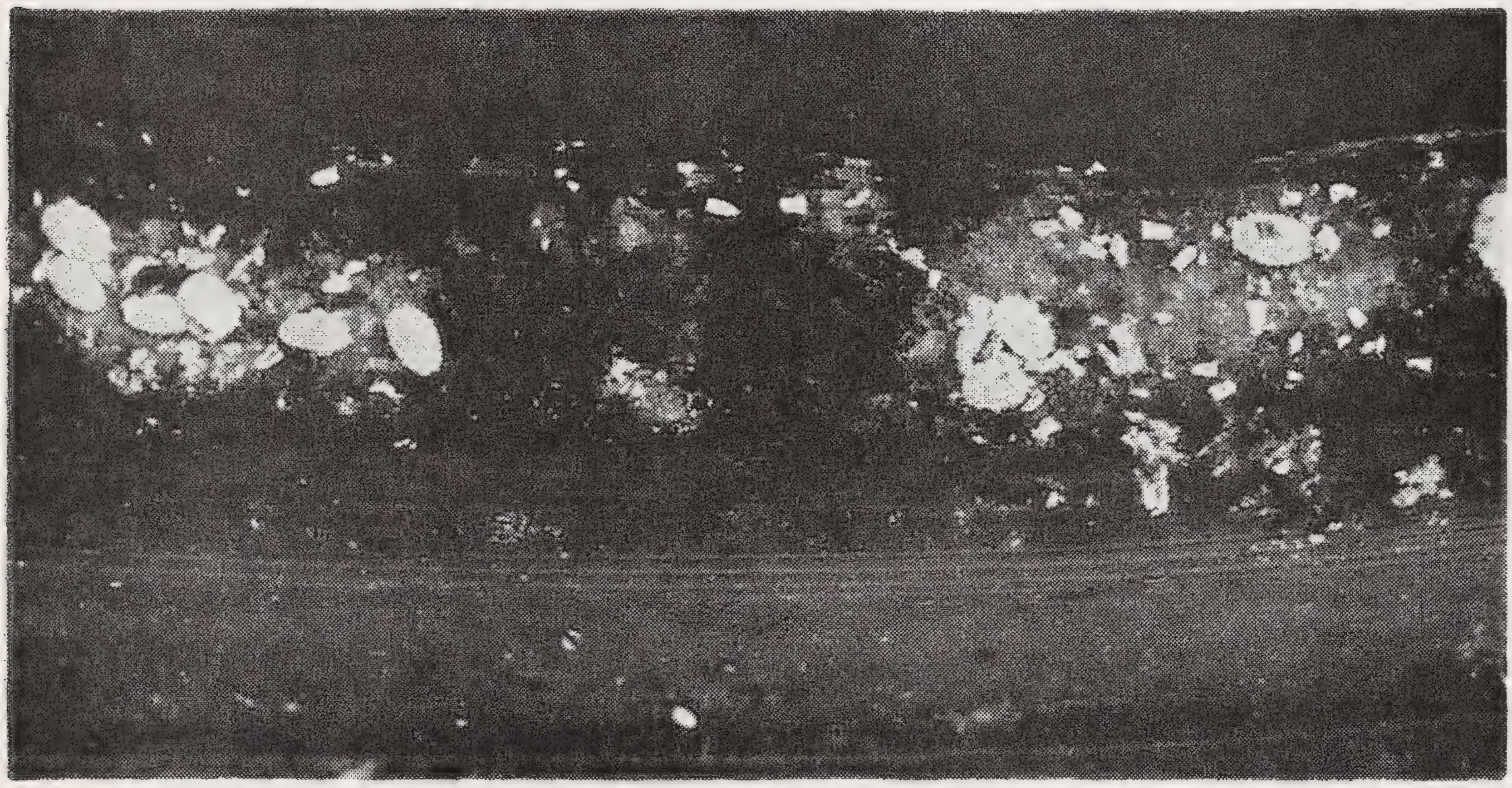


Fig. 26. Mealybugs on the foliage of *Hymenocallis* x *festalis (Elisena longipetala* x *Hymenocallis narcissiflora)* at Somerton, Arizona. Photo by Dr. Philip G. Corliss.

When I first identified the citrus mealy bug, it was easily controlled with D. D. T. or any of the standard garden insecticides. During the past year, however, it has apparently developed a resistance comparable to that of the red spider mites for these insecticides, and it has taken frequent thorough spraying with every available chemical to control the pest. Even so, it may be that only the advent of cold weather has aided me, and next season may result in a campaign which, if I lose, means that all of my *H.* x *festalis* must be discarded! This will be a great pity, for it is a never-ending source of wonderment that any plant could stand day after day in full sun for more than four months when the temperature in the shade never fell below 110 degrees and remain green, glossy, and floriferous!

DR. CORLISS EUROPEAN GARDEN TOURS

As we go to press word has been received that Dr. Corliss will start on an European Garden Tour on June 29, 1959; and again in the autumn (see page 148). Those interested should write to Arnold Tours, 79 Newbury St., Boston 16, Mass.

NERINES ARE BEAUTIFUL

EMMA D. MENNINGER, *California*

Modern hybrid nerines blossom in an array of brilliant colors ranging from white and the palest pink through the gamut of salmon, orange, scarlet and crimson to deep reds, even to purple and blue shades. Comprising about forty-one species, the entire genus is native to South Africa, growing in areas of little to heavy rainfall. Most are summer dormant, the lush dark green leaves flourishing in the cool rainy winters. With few exceptions, they are fall flowering, bringing a wealth of color to rival the autumn leaves. But instead of their bright colors proclaiming the end, they herald a season of burgeoning growth.

Their few to many flowered umbels, adorn scapes a foot or less, to as much as three feet tall and are as dainty as one could wish, being both sturdy and long-lasting. One intriguing quality of the blossoms is that many gleam with what is described as ''gold or silver dusting''. When seen in bright sunlight or an artificial light, the flowers appear to be closely set with minute transparent gold or silver beads, that have a glitter and sheen that must be seen to be appreciated. No need to fear dulled colors when exhibited at night under artificial light. The six perigone segments usually recurve gracefully at the ends, some having a waved or crisped edge. Nerine 'Pompadour' is an example of ruffled edges that is very pleasing. The color of this attractive nerine is vermilion 18/1 on the Horticultural Colour Chart (HCC). I like to check the colors with the above mentioned chart, although it is time consuming. The colors as we imagine them, may seem somewhat different than the names applied to them in the chart. However, a more accurate description can be had than mere words can give. One caution in using the chart with nerines is that I find that flowers held too close to the chart, using the black mask, may be graded too dark, because the chart color reflecting through darkness the flower color. Holding the specimen somewhat above the chart sample, I feel, will give a better reading.

Returning to the flowers, the tepalsegs may be from an inch or less to two or more inches in length and up to a half an inch in width. The decorative median line down the tepalsegs is usually either a lighter or darker shade of the flower, or it may be a contrasting color. A pretty seedling that we flowered this season, was white with a deep cerise line down the middle of the tepalsegs. It immediately won the appellation ''Candystick.''

The crosses bred from the *N. sarniensis* and *N. curvifolia* group, as a rule, have long protruding stamen filaments which give an airy elegance to the cluster. Those bred from the *N. flexuosa* group may have less symmetrical perigones with declinate styles and filaments. The former group comprises species with deep colors, while the latter are mostly in tones of pink or white. The latter species more often have the flowers come with the leaves or are comparatively evergreen, such as *N. bowdeni*.

Modern hybrids are a blending of characteristics inherited from the species, with apparently many colors and tones unknown in nature. Some of the pinks show decided lavender edges or stripes. Naturally, wide tepalsegs and large, not too crowded umbels are most desirable, while another point in favor, is when the flowers of an umbel open about the same time, instead of some of the first flowers having faded before the last buds have expanded.

The Royal Horticultural Society has granted many awards to nerines over the years. The first award to a hybrid, an F. C. C. (First Class Certificate) in 1887 to *Nerine* x *'mansellii'*, strangely enough, is still a favorite found in collections, being valued for its beauty as well as for its late flowering habit. From the Royal Horticultural Society List of Awards from 1859 to 1955 and the later Journals of the Society, I find the first award to a nerine that of an F. C. C. to the species *N. sarniensis* var. *corusca major* in 1864. In all there have been seven F. C. C.'s and eighty A. M.'s (Award of Merit) which include a sprinkling of species. A list of the F. C. C.'s may be of interest:

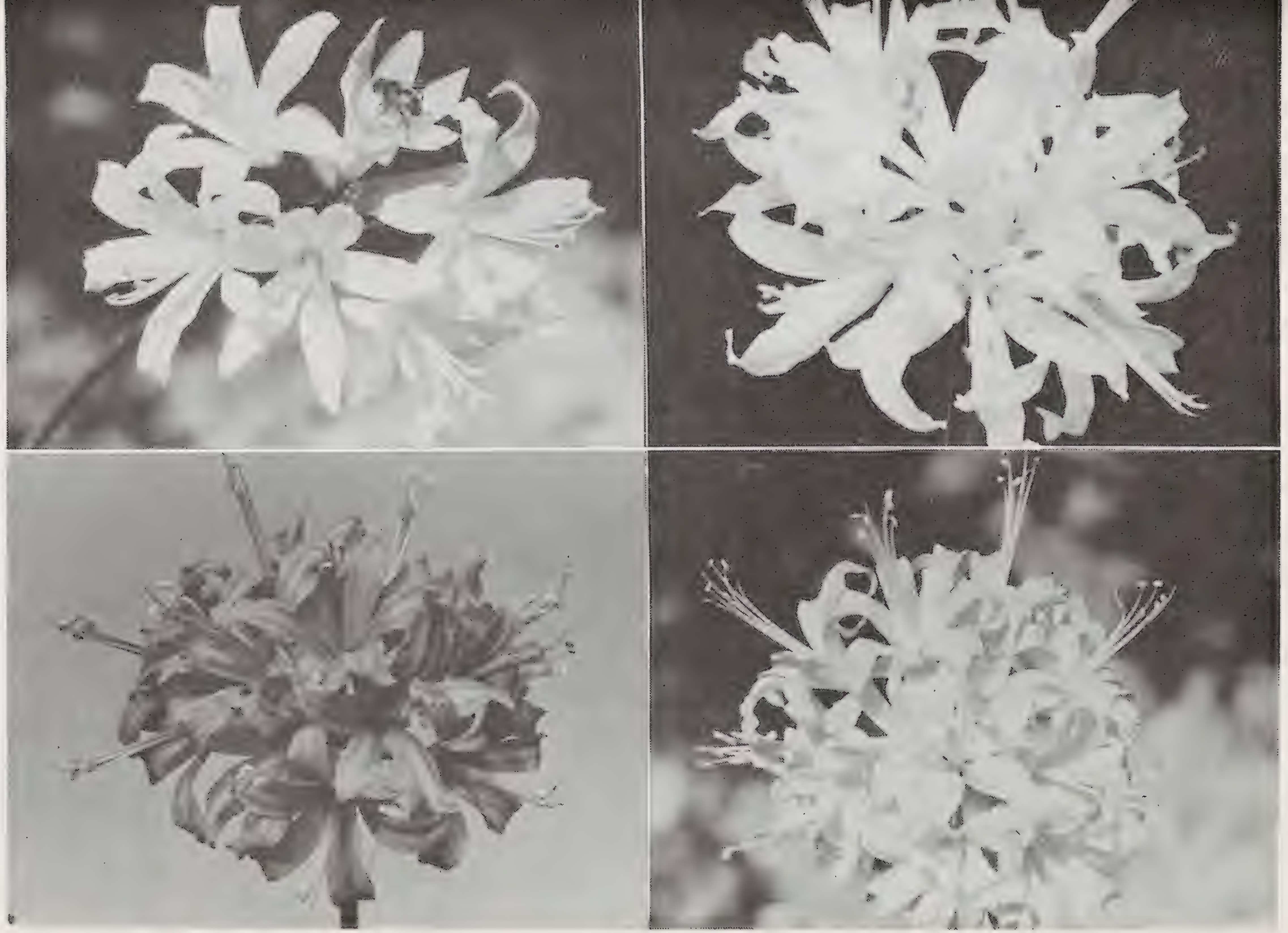
1864 *sarniensis* var. *corusca major,* an orange colored species.
1887 x *mansellii (flexuosa* x *fothergillii)* a tall rose-pink
1888 x *excellens (flexuosa* x *pumila).*
1893 x *elegans alba (flexuosa* x *sarniensis)*
1920 'Aurora' *(bowdeni* x *fothergillii)* a rose colored triploid.
1920 'Hera' a bright rosy-pink triploid.
1945 'Alice', a beautiful white triploid, the mother of the first tetraploid, 'Inchmery Kate'.
1955 'Nelson', a combination of fuchsia purple and turkey red.

Of the awards since 1945, the palm has gone to Mr. Edmund de Rothschild for his Exbury hybrids, for of the two F. C. C.'s and twenty-two A. M.'s granted, he has been honored with two F. C. C.'s and sixteen A. M.'s.

In the last few years, we have acquired a duplicate set of the Exbury collection, and this year we have about a hundred of these in flower, together with some thirty of our own Greenoaks seedlings with which we are much pleased. Some are average, some very good and several of award caliber.

Among the Exbury hybrids that we have flowered is the tetraploid, 'Inchmery Kate'. This nerine won an A. M., R. H. S. in 1949. It is a lovely soft pink with deeper centers, the flowers being very large with wide petals. The somatic chromosome number is 44 instead of the diploid 22. It was reported by E. K. Janaki Ammal in the Journal of the Royal Horticultural Society for October 1951. Two articles in this Journal give an extensive review of the cytology of both species and hybrid nerines. The author of the articles who discovered the tetraploid 'Inchmery Kate', believes it is the result of the selfing of 'Alice' instead of the reported cross of 'Alice' x 'Lady Foster'.

Another fine Exbury hybrid is 'Inchmery Elizabeth', A. M., R. H. S., 1942, it being a brilliant orange red. *N.* 'Dunkirk', also A. M., 1942, is one of Exbury's finest and largest. It has a large cluster of bright cherry red (HCC 722/-) flowers. My favorite among the Exbury hybrids is 'Susan', A. M., R. H. S., 1954. It produces large trusses of ex-



Hybrid *Nerine* clones: upper left, ‘King of the Belgians; upper right, ‘Solent Swan’; lower left, ‘Flamboyant’; and lower right ‘Fairy Wand’ as flowered by Mrs. Menninger at Arcadia, California, fall of 1958. Photos by Emma D. Menninger.

Plate 7

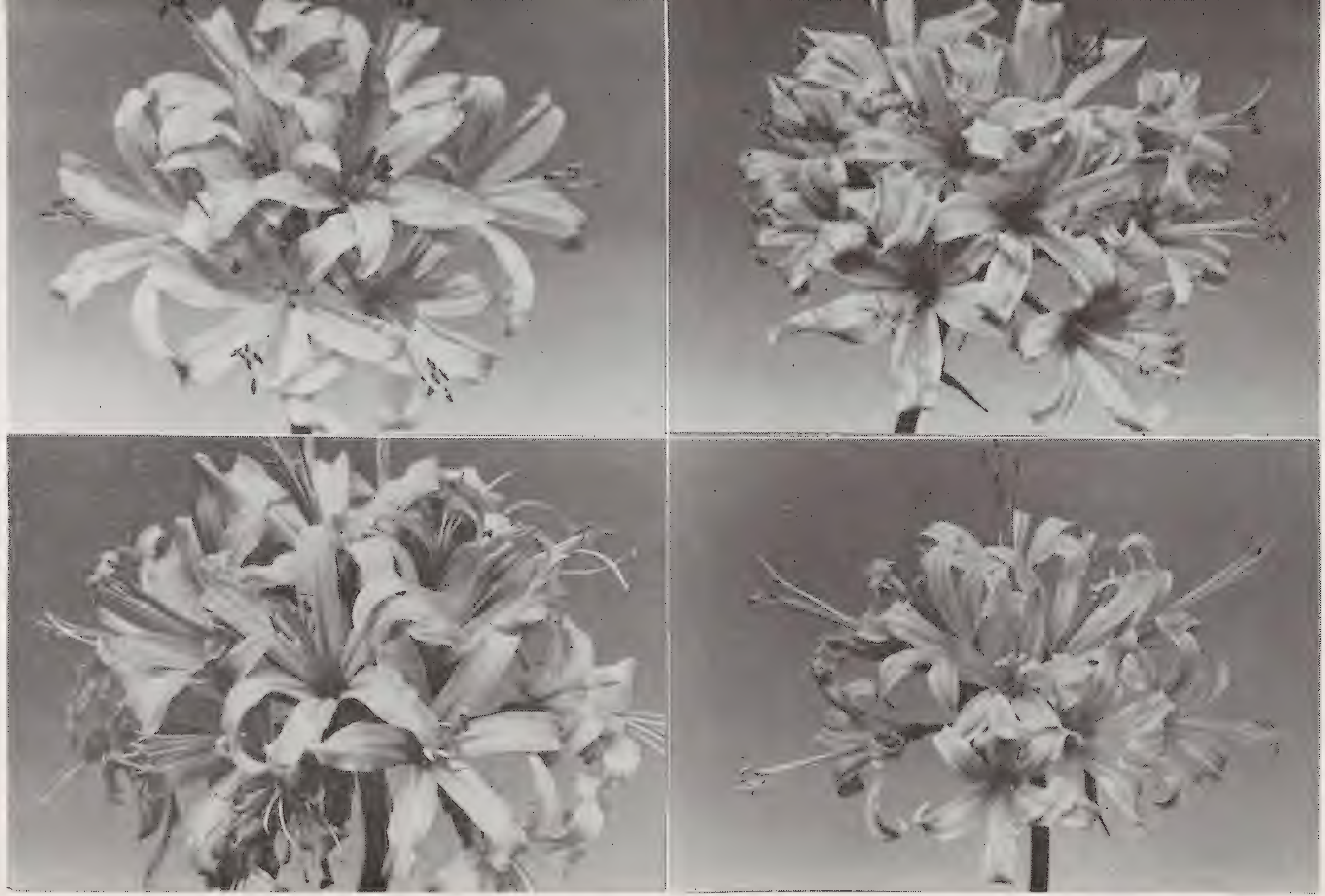
quisite flowers of carmine rose (HCC 621/1) with camellia rose (622/-) stripes and centers. It is a cross of 'Aerolite' and the large pale pink 'King of the Belgians'. At this writing it is just opening and the large size of the flowers on tall stems outshine the others in flower.

One of the older hybrids, that to my mind, has hardly been surpassed is 'Rotherside'. It checks signal red (HCC 719/-), a little misleading as to name. I describe it as deep salmon pink. Mr. Hanger's description in the Journal of the R. H. S. for September 1946, is pure salmon, while the R. H. S. Dictionary Supplement lists it as pale rosy orange. All these appear applicable, but here is an example of the value of the Horticultural Colour Chart rating in which the number 719/- can be consulted for a fairly true sample of the color. One must not forget, however, that colors may vary under different cultural conditions and with the age of the flower.

Among the white nerines, 'Solent Swan' is outstanding, being a large glistening white, displayed in a large umbel. 'Snowflake' is a pretty white, but for us is not as outstanding as 'Solent Swan'. 'White' is also good, although it has the faintest tinge of pink. An Exbury hybrid labelled 'Blue Seedling'' is blend of deep blue and touches of magenta. There are a number of clones in blue shades, such as 'Nautilus', with splashes and edges of cerise, magenta or lavender. I do not find these as pleasing as the clear colors. A recent award to Exbury in the newer combination of colors, *N.* 'Nelson', F. C. C., R. H. S., 1955, is described as ''fuchsia purple with broad perianth segments having a central streak of turkey red. It is the result of a cross between N. 'Aerolite' and N. ''Lionel'.'' (Journal of the R. H. S. January 1956) Two beautiful pinks are quite similar—'Pamela' and 'Wisley Bridesmaid'. The former is porcelain rose (HCC 620/1) and the latter porcelain rose (HCC 620/2). They both have darker median lines on large glistening perigones of the softest pink.

Some of the Greenoaks seedlings flowering for the first time this year, have been of comparable beauty to those described above. One a carmine rose (HCC 0621/2) has noteworthy silver dusting. It earned the name 'Sequin'. Another christened 'Fairy Wand' was deep pink geranium lake (HCC 20/1) with lighter centers (HCC20/2). The umbel and flowers are large, with wide segments. 'Sharon' is two shades of pink with centers of salmon pink, the edges of the tepalsegs being several tones lighter. It too, has a handsome umbel of large flowers. 'Avalon' is another deep pink, with darker centers and radiating lines. But not all the seedlings were pink. Indeed, in the thirty seedlings to flower, there were various tones of pinks, orange, red, old rose, blue, with only pure white lacking. 'Flamboyant' is a vivid flame color and 'Bengal Rose', a lovely rosy crimson called rose bengal (HCC25/1) and (HCC-25/1). 'Arcadia' is bright turkey red (HCC721/3). The quality of the flowers on first blooming was a pleasant surprise.

Flora and Sylva (1903-1905), edited by the noted English horticulturist, W. Robinson, in Volume 3, has one of the best articles on the early hybridizers of nerines. James O'Brien was said to have raised



Hybrid *Nerine* clones: upper left, 'Pamela'; upper right, 'Avalon'; lower left, 'Susan'; and lower right, 'Sharon', as flowered by Mrs. Menninger at Arcadia, California, fall of 1958. Photos by Emma D. Menninger.

Plate 8

thousands of seedlings, among which was *N.* x *cinnabarina (curvifolia* x *flexuosa)*; x *mansellii,* previously mentioned; *x elegans (flexuosa* x *rosea)* and x *o'Brienii (pudica* x *plantii)* this being described as carmine to slate blue. Another well known hybridizer was H. J. Elwes whose hybrids are still found in collections. Mr. Elwes aimed at producing leaves and flowers together, a field in which much might be attempted today. The species that might contribute most to this end is *N. bowdenii,* which with us is practically evergreen and it has the advantage of having large pink flowers and being among the most hardy of the species. *N. filifolia,* a dwarf species, is also almost evergreen, although it probably flowers more freely if given a short rest in late summer.

An interesting field for hybridization would be the production of more miniatures. There are a number of dwarf species such as *N. filifolia* and *N. masoniorum* that could be tried with the modern hybrids. No doubt many of such crosses, unknown to me, have been made.

Another promising area of hybridization is that of bigeneric hybrids. A number of these have been reported, but it appears that much more could be done. Janaki Ammal, in the above mentioned Journal, reports *N.* x *fletcheri* as a cross of *Nerine* with the Cape Belladonna, *Brunsvigia rosea.* This, she says is an easy cross which has been repeated in the R. H. S. Gardens at Wisley. It flowered in 1942 when the pollen sterility was found to be as high as 96%. She also reports an alleged cross of a *Nerine* with an *Agapanthus,* which received an A. M. in 1896 as *N.* 'Novelty'. However she shows some doubt as to the authenticity of the cross. Another bigeneric cross, *N. marginata* with the Cape Belladonna, *Brunsvigia rosea* was reported in HERBERTIA for 1958.

As aforementioned, the cytology of nerines has been interestingly dealt with in the Journal of the Royal Horticultural Society for October 1951 by Janaki Ammal entitled,—"The Chromosome History of Cultivated Nerines" and in the same issue,—"Chromosome Numbers in Hybrid Nerines" by the above author and Margery Bridgwater. The highlight is the report of the first tetraploid nerine, 'Inchmery Kate' from the Exbury Gardens of Mr. Edmund de Rothschild. Some time ago when our bulbs of 'Inchmery Kate' flowered, I attempted to self it, but was unsuccessful. Perhaps it is self-sterile, or perhaps my failure was due to my being unaware, at that time, of the dichogamous nature of nerines and failure to apply the pollen when the stigma was receptive. The above articles give an exhaustive list of about one hundred chromosome counts which include diploids, triploids, the one tetraploid and a number of aneuploids. The triploids and aneuploids appear to be very fertile. *N.* 'Alice', the seed parent of 'Inchmery Kate', is a triploid plus with $2n=36$ chromosomes, while 'Inchmery Kate' has $2n=44$, or four times the basic number of $2n=11$. Janaki Ammal remarks: "Many of the best hybrids of today have come from these and similar triploids." In contrast, in *Cymbidium* orchids, the triploids are almost completely sterile.

Other chromosome counts of nerines have appeared in HERBERTIA. One by W. M. James and F. T. Addicott in 1941 lists six species and five hybrids, while J. B. Gouws of the University of Pretoria reported a number of species counts in HERBERTIA for 1949.

The habitat of nerine species covers various conditions of temperature and rainfall. L. B. Creasey in HERBERTIA for 1937 says: ''Nerines grow under a wide range of natural conditions . . . and any which show a tendency to retain their foliage, should not be completely dried off.'' Nerines can be grown out of doors in much of California and other areas with similar climatic conditions. Since California has winter rains—the growing season, and dry summers—the dormant season, it would seem as though it would be ideally suited to nerines. I must say here that I do not pretend to be an expert at growing nerines, in fact, I feel that I am just beginning to learn a little about them. I have learned by experience that the recommended culture for England and coastal areas, must be changed for regions of warmer summers, such as our San Gabriel Valley, where the temperatures in September and October of this year hovered near the hundred degree mark. Frequently this occurs during much of the summer and the recommendation to give the dormant bulbs ''a good baking in the sun'' as is frequently advised, is too drastic. Many of the bulbs simply shriveled so badly they died or were set back considerably. Therefore, I believe that an occasional watering in the summer in hot dry climates will be beneficial in keeping the bulbs plump and a spraying of the pots when temperatures are high, will serve to cool the bulbs by causing evaporation. Morning sun seems to be to their liking, but hot overhead sun is too severe. *Nerine sarniensis,* in the background of many of the modern hybrids, comes from Table Mountain, where in summer the crest is seldom seen owing to the cloud cover or ''tablecloth''. When we were in Capetown and environs in October of 1957 (spring), it was very clear but cold with occasional rain that left the mountain tops near Stellenbosch white with fleeting snow. A friend who grows cymbidiums near the Cape, wrote that they seldom have temperatures over 90%, and 95% is most unusual. Our nerines are grown in pots and a concession to higher temperatures is to plant the bulb with the top an inch or so below the soil, instead of being exposed as is usually recommended. There seems to be no danger of the bulbs rotting since the pots dry out quickly. Of course in winter during active growth, much water is needed. As soon as the flower buds or leaves appear, the pots are given a good watering. The frequency of watering is gradually increased and when the plants are in full growth, the pots are not allowed to dry out.

A good sandy loam with much humus seems ideal. In our potting mix of oak leaf soil, we include the compost in which our cymbidium seedlings have been grown for a few months, by about one third. It includes fir bark, peat moss, redwood bark fiber to which was added some fertilizer such as bone meal, hoof and horn, and manure. This is still very coarse when added to the oak leaf soil.

While fairly hardy—the *N. bowdenii* varieties are grown out of doors in southern England—nerines will not, I believe, stand freezing. Although frost is rare here, at least in the last few winters, we keep our pots of nerines in unheated greenhouses. Since the usual recommendation is to ''secure the greatest possible development of the bulb'', an occasional feeding with liquid fertilizer or top dressing with blood meal or other fertilizer may be given when the plants are in active growth.

A factor in flower production, is that nerines require a good light intensity to bloom. In one of our greenhouses, we have the usual bench with another narrow shelf above. This is definitely not desirable, because the lower shelf receives less light. While it seemed that not much light was cut off, it was a surprise to find that while the upper shelf received 500 foot candles of light, the pots directly beneath, at the same time, received only 125 foot candles. Most of the plants in the more shaded places did not flower. While the reading was taken in the late afternoon, when the greenhouse was shaded, there is usually morning sun. Obviously this situation is being remedied.

It is not necessary or probably desirable to repot nerines oftener than every three or four years. Each August, I remove the top soil and any bulblets that have formed and top dress with rich soil. If necessary to repot, the bulbs can be shaken out and repotted. There is a question in my mind if this is at all harmful, for it appears that the bulbs form new roots each season. In hot regions, larger pots can be used, for the additional soil helps to insulate the bulbs against the heat. I believe our nerines have not flowered as well as if they had less severe summers and I hope to counteract the adverse effects as much as possible in the future. On the other hand, it has been reported that in very humid climates, nerines suffer from mildew, although I have not heard of this condition in England which has a fairly damp climate. It has been suggested that by hybridizing with species from regions of high rainfall or summer rain, this objection might be overcome. Such hybrids would be better adapted to places with summer rains, such as Florida.

The offsets or bulblets previously mentioned, which are freely produced, may be planted in community pots, one for each variety, if they are too small for individual pots. They sometimes flower in a year or two depending on the size.

Perhaps my method of identifying each clone, whether division or seedling, may be of interest. Each clone is given a number composed first of a letter indicating the source, then the year acquired and finally a serial number. Thus E54-8 would be the eighth bulb from Exbury in 1954 and G54-8 would be one of our Greenoaks seedlings sown in 1954 with the serial number of 8. Every clone can be accurately labeled and a card index can be kept to record divisions, flowering dates, descriptions with the Horticultural Colour Chart number and in case of loss or disposal, this too, can be entered.

The fruit of the nerine is a three-celled capsule, each of the cells may contain one or more fleshy green seeds. These are a little smaller and less globular, especially in the hybrids, than a pea. From one umbel of *N.* 'Fairy Wand' with nine flowers, 116 seeds were produced, one of the flowers having no seeds. They look good for the most part, but only time will tell if they are viable. The seeds ripen shortly after the flower fades and when the capsule begins to burst they must be removed and planted or rather laid on the surface of a good compost. They will sprout very soon if kept slightly damp. There they may remain in the same pot for two years and at this stage are evergreen and may be watered in the summer. Some of our seedlings flowered in three years, others several years later. Some seedlings started in 1952 have not yet flowered. Although I have not had much time for controlled crosses, we are very happy with the seedlings that have flowered. The quality of the flowers and the range of color have been unexpectedly good.

Nerines, whether one has few or many, are always thrilling when in flower and are much admired by visitors. A young boy who helps us on Saturdays, on seeing the many nerines in flower, commented: ''Those are the prettiest flowers I have ever seen.''

Greenoaks, Arcadia, California.

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LYCORIS IN NEBRASKA

VIVIAN BARNICA GRAPES, *Nebraska*

I have had the pleasure of growing *Lycoris squamigera* in my garden since 1932 and its rose-lilac blossoms are always a pleasant surprise during August. It is perfectly hardy here, even in more open situations. There is a slight variation in growth of bulbs from three different sources, the blossoms are a bit darker colored, taller growing and the foliage longer on the two later additions.

In 1946 I purchased bulbs labeled ''L. purpurea''; they have been growing in the same parts of my garden as *L. squamigera* and seem to be equally as hardy. The blossoms are darker, a month later than *L. squamigera* and the foliage more narrow. A bloom stalk was identified, by Dr. Traub, this fall as *L. haywardii.*

Lycoris incarnata, L. sprengeri and *L. sanguinea* were added in 1954. *L. incarnata* has made a good increase and *L. sprengeri* bloomed for the first time this fall. *L. sanguinea* has bloomed around August 22 the last three years and sets seeds. The funnel-shaped blooms, 1½ inches across are brick-red, the bloom stalk 12 inches high. Here none of these put up any foliage until early spring.

Some foliage measurements made the latter part of May are given below:

L. squamigera [obtained 1932] ⅞ to 1 in. [2.—2.5 cm.] wide, 18 in. [45.7 cm.] long.

L. squamigera [obtained 1939 & 1946] 1 to 1¼ in. [2.5—3.2 cm.] wide, 25 in. [63.5 cm.] long.

L. haywardii 7/16 in. [1.1 cm.] wide, 18 in. [45.7 cm.] long.

The above are all ten year old clumps.

L. incarnata ¾ in. [1.9 cm.] wide, 18 in. [45.7 cm.] long.

L. sprengeri ¾ in. [1.9 cm.] wide, 18 in. [45.7 cm.] long.

L. sanguinea ½ in. [1.3 cm.] wide, 13 in. [33.0 cm.] long.

This fall I have planted for trial in the most sheltered part of my garden, bulbs of all the other species of *Lycoris* that I have been able to obtain.

LYCORIS RADIATA BY THE THOUSANDS

Wyndham Hayward

One of the few Far Eastern bulbous plants which have adopted Florida and the Lower South as its own is the popular red *Lycoris radiata.* This is the darling of many an humble dooryard in the Gulf Coast area, from North and West Florida around to lower Texas.

Lycoris radiata is not reliably hardy in the upper South but has been grown well with good flowering results in protected locations as far North as Washington, D. C. and Southern Ohio. In some parts of the South especially Alabama, Mississippi and Louisiana it is so common and thrifty, it is almost a weed, and one hears of gardeners digging up a bushel from their beds and giving them away!

Dozens of offers of the bulbs are found in the lower South Marketing Bulletins, state publications for farmers and other country people.

Traub and Moldenke in their ''Amaryllidaceae: Tribe Amarylleae'', 1949, place *Lycoris radiata* as species No. 7 of the genus, in the Sub-Genus II, *Lycoris.* They give the range as China and Japan. It has a confused botanical history, extending even to its introduction and identification in the South, where it was known as *Nerine sarniensis* for many years. The writer and W. M. James of California cleared up this mis-identity some 20 years ago. At the present time the proper name *L. radiata* has become general for the bulb.

Without doubt, a vigorous specimen of *Lycoris radiata* in full bloom is one of the most gorgeous, exotic and beautiful flowers of all the vegetable realm. The tepalsegs glisten as if with fine gold dust, and the bristling stamens and pistils make a positively radiant picture. The color is a flaming bright red. The individual flowers open one after the other until the full umbel is expanded before the flowers begin to fade.

According to Baker in 1888, (Handbook of the Amarylleae) the Dutch Medical botanist Engelbert Kaempfer noted *Lycoris radiata* in Japan. No careful survey of the native sites of this bulb in China

[**LYCORIS RADIATA—HAYWARD,** continued on page 80.]

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1958 EUROPEAN TRAVEL NOTES

Philip G. Corliss, *M.D.*
Somerton, Arizona

During the past few years that I have been taking 'Garden Tour' parties to the British Isles, the Low Countries, and Paris, I have pondered the question of whether I prefer the gardens and flower shows of spring or fall. Summer trips are avoided because all travel facilities and accommodations are taxed by the school-vacation travellers; because the weather, rarely good by California or Arizona standards, is likely to be uncomfortable in summer; and most of the people you wish to see are also away "on holiday".

I think that Fall is my choice. There are more horticultural subjects in bloom in the spring, it is true, but they are spotty-beds of bulbs at peak bloom next to others that have finished or not yet flowered. The fall colors of the trees and heather are gorgeous, and the roses. chrysanthemums, and dahlias are ablaze with color, not ending, as do the spring flowers, but constantly opening new bloom until stilled by frost.

My first horticultural tour of England was made in the spring. It seemed as though all the trees were flowering ones—chestnuts, golden rain, and hawthorne, supported by masses of azaleas and rhododendrons. I wondered what charm the countryside could display in the fall. On my next trip, I learned. Not only do the trees take on the autumn foliage colors, but the red beeches and white birches are interplanted with the other trees so that every copse and dale is actually like a beautiful landscaped garden.

Fall-blooming flowers are used more widely over there than in America. Everywhere the spring bulbs are replaced by dahlias and chrysanthemums, and the hardy perennial asters are universally used.

There is also a wider variety of spring bulbs to be seen everywhere abroad than in the United States. Tulips, daffodils, Dutch iris, crocus, and scillas are seen everywhere, but there are also ixias, species and baby gladiolus, fritillaries, camassias, and many other spring bulbs which our gardeners simply will not try because they are not familiar with them.

It is always a joy to visit the fields and glass houses of the Van Tubergen firm at Haarlem. This spring even a rain drizzle couldn't dampen my spirits as I made the rounds with Mr. Hoog, Sr. Great blocks of flowering bulbs native to South Africa were especially intriguing. One bed of a species *Gladiolus* was supposed to be *G. blandus,* but Mr. Hoog was not certain, so we went to his library (what a library!—built by all the owners of this firm since its establishment) for a description of *G. blandus.* Here I was introduced by Mr. Hoog to the superb volume "South African Flowers for the Garden" by Sima Eliovson, published by H. Timmons at Capetown. (When I returned to London

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I tried to buy it—and Harrod's secured a copy for me—which they said was the only one available in London at the time.)

There are several spring bulbs at Van Tubergen's which surely deserve the attention of our gardeners. There are so many beautiful tritonias, a spring-flowering relative of the gladiolus which should be better known. Two brodiaeas were new to me—the red-and-green-flowered *Brodiaea coccinea* and the yellow *Brodiaea ixioides.* Unlike their hybrid hyacinth relatives, they should not be a one-season wonder in our gardens. A wonderful bulbous *Iris* species is I. *latifolia,* which has large flowers and tall strong stems, and should prove valuable in breeding. Why don't we adorn our spring borders with the *Nerine angustifolia,* which I admired here at Van Tubergen's? The fall-blooming nerines are temperamental beauties, only *Nerine bowdenii* accepting more than a few habitats.

The *Amaryllis* breeder of Ludwig and Co. at Hillegom, Mr. A. G. A. Jansen, had kindly arranged to retard several dozen bulbs of their new named *Amaryllis* clones so they would be in bloom at the time our party visited their nursery. We were especially impressed with the brilliant 'Candy Cane' and the red 'Invincible', while the lovely pink 'Apple Blossom' was liked by all of us. Ludwig is offering their picotee-flowered *Amaryllis,* about which I wrote in these pages last year, although it still may throw an occasional touch of red on the broad white petals which have such a tiny red pencil edging. They have also named three of their "Gracilis" *Amaryllis*—the small-flowered type bred from A. *striata* x large-flowered hybrids.

Is there a more spectacular flower than the large *Amaryllis* of the 'Royal Dutch' strain? I think the large ones are surely a man's flower. They have boldness, brilliance, and are surely traffic-stoppers. It is something of an anticlimax to add a note from the U. S. scene at the end of this paper, but I feel it only fair to say that Dr. Traub has bred some dazzling pure white amaryllis which are apparently more suitable for gardens of our temperate region than the presently available whites from Holland; and the blackest red *Amaryllis* I have yet seen was bred by one of our hemerocallis enthusiasts of Houston, Texas. I have not yet seen any *Amaryllis* hybrids which justify being called blue. But our hemerocallis breeders are close to blue, so doubtless the amaryllis workers will achieve lavender and purple—and perhaps, one day, a blue.

NEW CLONE OF MYOPORUM LAETUM

HAMILTON P. TRAUB, *California*

In southern California *Myoporum laetum* from New Zealand makes a very valuable wind-break, particularly on the Pacific Ocean coast where it can withstand the salt-spray. It may be grown as a shrub with trimming, or as a small tree up to 25 feet. It is evergreen, drought resistant and fast growing. Unfortunately it is propagated by means of seeds at present in spite of the fact that the progenies are quite variable and produce a superabundance of messy fruits. Some of the seedlings are not as useful as others. Thus it is desirable to select superior seedlings for vegetative propagation.

From a large number of seedlings grown at La Jolla, Calif., one outstanding clone has been selected that is definitely superior to all of the others seen.

Myoporum laetum cl. 'Traub's Compact'. Plant relatively compact, many-branched, leaves relatively smaller, almost elliptic. Fruits relatively few.

This plant is easily propagated by means of cuttings. In the present experiments, 4 to 5 inch cuttings gave 100% rooting in a soil medium of ½ loam and ½ granulated peat. The use of the University of California basic soil mixes B or C will most likely give equally good results (see Manual 23. The U. C. System for Producing Healthy Container-Grown Plants'', by K. F. Baker et al. $1.00. Agric. Publ. 22 Giannini Hall, Univ. of Calif., Berkeley 4, Calif.)

BEST PLANTS FOR THE COOL GREENHOUSE

S. B. Whitehead, in Gardeners' Chronicle, Lond., 144: 156-157, 1958, discusses the best plants for a cool greenhouse, which latter is defined as ''one where by periodic heating as required, the temperature is kept just above 40° F. in the coldest weather.'' The list of plants includes *Primula obconica, P. malacoides, P. sinensis, Erica hyemalis rosea, Cytisus racemosus, Euphorbia fulgens, Acacia drummondii, A. arnuta, Loropetalum chinense, Solanum capsicastrum, Begonia* cl. 'Gloire de Lorraine', 'Elatior', 'Mme de Rothschild', *Cyclamen persicum* (finest forms), including cl. 'Grandiflora', *Freesia* hybrids, in various colors, *Lachenalia aloides, L. nelsonii, L. quadricolor, Cinereria, Schizanthus, Calceolaria, Salpiglossis,* Winter stocks, *Celsia arcturus, Jasminum polyanthum, Lapageria rosea, Plumbago capensis, Streptodolen iamesonii,* and *Salvia patens.* He reproaches himself for omitting such fine subjects as chrysanthemums, carnations, pelargoniums, and so on.

EUGENIA PANICULATA CLONE

HAMILTON P. TRAUB, *California*

The Australian Bush Cherry, *Eugenia paniculata* Banks, is widely grown in California as a hedge or wind break. It is propagated by means of seeds and thus the individual plants vary very widely. The fruits are usually large-seeded and quite astringent to the taste, and they are not used as a dessert fruit or in making jelly in California.

Recently the writer raised numerous seedlings of *Eugenia paniculata* and to his surprise found several plants with relatively small-seeded, large, mild, pleasantly-flavored fruits. These have been eaten with relish as a dessert fruit either out of hand or with cream and sugar like strawberries.

One of the finest seedlings has been propagated vegetatively as a clone, and has been named, 'Traub's Choice' since it was chosen out of several superior seedlings for its high quality fruits.

Eugenia paniculata Banks, clone 'Traub's Choice' (Myrtaceae)

The fruits are usually broadly pear-shaped, rarely roundish, dahlia purple (HHC 931) in color outside, and the flesh is lilac purple (o31/1). The dimensions based on the measurement of 20 fruits taken at random are as follows:

Fruit, length, range, 2.10 to 2.40 cm.
width, range, 1.80 to 2.35 cm.
Seed, diameter, range, 0.55 to 0.70 cm.

The plant is a vigorous tree and is easily propagated by means of cuttings, either with or without the use of plant regulators (hormones) such as rootone.

The type specimen No. 633 (TRA), of the clone, has been deposited in the Traub Herbarium.

A REVIEW OF THE GENUS **GAGEA** SALISB.

J. C. Th. Uphof, *Florida*

[Continued from page 132, **Plant Life,** Vol. 14. 1958.]

Subsection 2. **Pygmaea** Pascher, Lotos, n. ser. 14: 111. 1904. Most species having a vigorous, obovoid gynoecium; style relatively short, about as long as the ovary; stigma round, slightly 3-lobed; androecium half as long as the perigone.

7. G. liotardii (Sternb.) Roem. et Schult. Syst. 545, 1704; *G. fistulosa* (Ram.) Ker-Gawl. Journ. Roy Inst. 1:180, 1816; *G. pygmaea* Salisb. in Kon. et Sims, Ann. Bot. 2:557, 1806; *G. algeriensis* Chab. in Bull. Soc. Bot. France 26:320, 1889; *Ornithogalum fragiferum* Vill. Hist. Plant. Dauph. 2:270; *O. fistulosum* Ram. ex DC. Flor. France, 3:215; *O. liotardi* Sternb. Denkschr. Bot. Ges. Regensb. 2:56, 1818; *O. bohemicum* Lois. Flor. Gal. ed. I, 1:243.

Description.—Plants 10 to 12 cm. high. Bulbs two. Basal leaves 1 or 2, round, hollow, grooved at the base, 2 to 4 mm. wide. Cauline leaves two, almost opposite, lanceolate, laying toward the inflorescence, lanceolate; the lower one with a broad base, narrow toward the apex, longer or shorter than the umbel. Bracts small. Inflorescence 1 to 5-flowered. Pedicels somewhat hairy, 4 to 5 times longer than the perigone. Segments of the perigone obtuse, elliptic-lanceolate. Stamens hardly half as long as the flowers. Var. *laevipes* Henri Jaccard (var. *glabra* Dalla Torre et Sarntheim) has glaborus pedicels; var. *fragifera* Vill. (var. *bulbifera* Henri Jaccard) produces many bulblets instead of flowers.

Notes.—This is one of the few alpines among the Central European species where it flowers in June and July. The plants grow in fertile meadows, humic soils in the Alps, usually to 1200 m. alt. occasionally reaching 2400 m. among which in Wallis at 2470 m. It is distributed in the Pyrenaea, Alps, Corsica, Apenines and Himalaya region.

8. G. DISTANS Pasch. Lotos N. F. 14: 118-119, 1904.

DESCRIPTION.—Plants slender, 4 to 15 cm. high. Bulbs of medium size. Tunic with few or without fibres. Stems frequently attentuate at the base, somewhat robuste, upright or slightly flexuose. Basal leaves narrow more or less filiform, seldom wider. Basal leaves often sideways remote from the internodes; the lower ones often much longer, oblong or ovate-oblong; the upper ones long and somewhat attenuate, frequently elongate recurved, 3 to 9 mm. wide, shorter than the inflorescence. Internodes of the flowercluster long. Cauline leaves at some distance. Bracts smaller than the caulines leaves. Pedicels longer than the flowers. Flowers 8 to 10, seldom 15 mm. long. Segments of the perigone oblong, somewhat yellow; inner segments oblong or obovate-oblong. Capsule more or less emarginate.

NOTES.—Native to Spain. Exsiccata: Porta Rigo. Iter. Hosp. II. 1890, nr. 40; Hater, Porta Rigo, Plant. Hisp. nr. 52, 1879.

9. G. DURIEUI Pasch. Lotos N. F. 14:112, 1904.

DESCRIPTION.—Plants slender. Stem more or less flexuose. Basal leaves more or less filiform. Lower cauline leaves oval, elongated toward the apex, somewhat filiform, narrow attenuate. Inflorescence few flowered. Pedicels about double the length of the flowers. Outer tepals of the perigone usually attenuate, obtuse toward the apex; inner tepals oblong or subovate-oblong, obtuse or slightly acute. Tepals are often spotted with red.

NOTES.—Native to Northern Africa, especially Algeria.

10. G. COSSONIANA Pasch. Lotos N. F. 14:119-120, 1904.

DESCRIPTION.—Plants often with an elongated stem, to 25 cm. high. Bulbs large. Tunic membranaceous, dark ash colored, unequally incissed, covered with fibres. Basal leaves about as long as the inflorescence or slightly longer, narrow linear, somewhat thickened, toward the base attenuate, near the apex attenuate acute, 1 to 1½ mm. wide and 20 to 25 cm. long. Cauline leaves conspicuous, 1 to 5 cm. long, the lower ones as long as the inflorescence, somewhat clasping, concave at the base, oblong-linear or ovate-linear, toward the apex slightly attenuate, acute or obtuse, 4 to 9 cm. long. Inflorescence 3 to 7-flowered; bracts linear, attenuate toward the apex, half the length of the pedicels. Pedicels double the length of the flowers, spreading. Flowers small, 8 to 11 mm. long. Outer tepals, small, linear-oblong, toward the apex and base somewhat attenuate; inner tepals oblong, often on both sides to a high degree attenuate, at the apex obtuse. Stamens half as long as the perigon; filaments toward the base somewhat dilatate. Ovary obovoid, at the base slightly attenuate, retuse and emarginate; stigma 3-lobed.

NOTES.—This species differs from the *G. pygmaea* by the strongly developed bulbs and the peculiar formation of its fibres. Pascher supposes that it may form a southern race of *G. pygmaea*. There has not been, however, sufficient material available to substantiate this. Yet

G. Cossoniana should be considered a distinct species. Native to Northern Africa.

11. G. FOLIOSA Schult. Syst. 7; 1704, Boiss. Flor. Orient. 5:205, 1881; *Ornithogalum spathaceum* Flor. Graec. Lab. 341 non Schult.; *G. polymorpha* Boiss. Voy. Esp. ex parte; *G. billardieri* variarum coll. or. non Kunth; *Ornithogalum luteum* Flor. Pelop. non Schult; *G. pygmaea* var. b Roem. et Schult. 7;1705.

DESCRIPTION.—Bulbs in two's. Tunic usually leathery. Basal leaves linear-lanceolate or filiform, grooved. Stem loose or corymbose, 1 to few flowered. Cauline leaves alternate, seldom more or less opposite, glabrous or ciliate, lanceolate, accuminate. Pedicels slender. Perigone yellow with linear-oblong segments. Filaments one third the length of the perigone. Anthers ovate. Capsule obcordate.

NOTES.—Native to Greece, Crete, Thrace, Cyperus, Armenia, Transcaucasia, especially in the mountains to the subalpine zones. *G. nevadensis* Boiss. and *G. corsica* Mutel which are mentioned by Pascher as separate species, are referred in the Index Kewensis to *G. foliosa*. *G. nebrodensis* Nyn. Syll. 372. probably belongs to this group.

Subsection 3. **Arvensis** Pascher, Lotos, n. ser. 14: 122. 1904. Ovary strongly developed; style about 1.5 times as long as the ovary; stamens usually half the length of the flower; flowers in many cases larger than those of Subsection 1. Chrysanthae.

12. G. BOHEMICA Roem. et Schult. sensu ampl. Syst. 7:549, 1705.

DESCRIPTION.—Plants small and low. Basal leaves more or less filiform, moderately curved to attenuate. Inflorescence few flowered. Pedicels 9 to 16 mm. long. Segments of the perigon obovate, oblong, obtuse.

NOTES.—This species is very variable and is composed of forms that are often considered as species, among which is *G. saxatilis* Koch., *G. zauschneri* Pasch., *G. alleppoana* Terracc. and others. Morphologically they resemble each other and show close relationship by transition forms. Many of such have been found near Magdenburg, Germany. This species is considered as being originally Mediterraenean which passed into the Pontic region, to Austria and Central Germany, where the plants are sterile. This condition has been ascribed to a failure of pollination due to the absence of insects native to the Steppe region. This explains perhaps the abundant production of bulbs, which often dominate in areas where non-flowering plants predominate.

13. G. ZAUSCHNERI (Pohl) Pasch., Lotos, N. F. 14:1904: *G. szovitsii* Besser. ex. Schult. Syst. 7:550, *Ornithogalum bohemicum* Zauschn. Abhandl. Privatges. Prag. 2:120, 1770;—*O. zauschneri* Pohl. Flor. Bohem. 2:14.

DESCRIPTION.—Bulbs small. Plants 4 to 5 occasionally 8 to 10 cm. high, glabrous, sometimes more or less hairy. Stem robust. Basal leaves round, filiform. Cauline leaves somewhat expanded, with a sheathlike base, frequently pointed. Inflorescence with a few flowers. Flowers 15 to 18 mm. long, deep yellow, generally longer and wider than of *G. saxatilis*. Margin and back of the perigone more or less hairy. Outer segments of the perigone broad, obtuse, about 3 to 7 mm. wide; the inner ones obovate, 3 to 6 mm. wide, often irregular, narrowing at the base. Ovary obvate.

NOTES.—This species is distributed in Southern Europe, especially in the Balkan Peninsula, Southern Russia, Hungary, Syria, Palestina. It has been but seldom observed in Germany and Austria and is apparently absent in Switzerland.

14. G. SAXATILIS Schult. Syst. 7:549; *G. bohemica* Gren. et Gord. Flor. Fr. 3:195; *Ornithogalum fistulosum* Roth, Enum. 2:42; *O. bohemicum* Ten. Flor. Nap. 1:172.

DESCRIPTION.—Bulbs two. Plants reaching a height of 2.5 to 8 cm. Basal leaves longer than the flower stalk, filiform, bent or curved. Cauline leaves 4 to 5, usually lanceolate, 4 mm. wide. Flowers solitary or in umbels of 2 to 3 flowers, light yellow. Segments of the perigone long-oblanceolate, obtuse, about 1 to 1.3 cm. long. Ovary obovate. There are a number of individuals that produce a large number of bulblets known as var. *fragifera* Zimmern.

NOTES.—This species prefers sunny rocky places, composed of granite, porphyr and tertiary lime. Occurs occasionally also along roads, on level land and in the mountains to about 600 m. alt. It is a native of the Iberian Peninsular, Italy, Central and Western France, it is less frequent in Central Germany and Western Switzerland.

15. G. STELLARIS Salisb., in Kon. & Sims, Ann. Bot. 2:556 (err.356). 1806; *G. arvensis* Dum. Flora Belg. 140; Boiss. Flor. Orient. 5:205. 1881. *G. villosa* Duby Bot. Gall. ed. II 1: 467; *Stellaris minima* Moench Meht. 303, 1794; *Ornithogalum arvensis* Pers. in Usteri, Ann. Bot. 11; 8, 1794; *O. minimum* Willd. Spec. Plant. 2:114; *O. villosum* Bieb. Flor. Taur. Cauc. 1:274.

DESCRIPTION.—Bulbs two. Tunic membraceous. Plants reaching a height of 7 to 5 cm. Flowering stalk usually hairy. Basal leaves two, linear, 0.5 to 2 mm. wide often longer than the inflorescence. Cauline leaves inclined toward the flower cluster; the lowest lanceolate at the base 1 cm. wide; the upper linear, rough hairy along the margin, in the axils often forming bulblets. Inflorescense 5 to 10-flowered united into an umbel-like cluster. Segments of the perigone yellow, lanceolate, 10 to 15 mm. long, obtuse. Pedicels and segments of the perigone more or less rough hairy. Ovary obovate. Capsule long obovate, obtuse, slightly shorter than the segments of the perigone. Among the different varieties belong var. *typica* Beck (var. *pubescens* Peterm.) with hairy flower stalks and upper leaves; var. *semiglobra* Beck with glabrous stems and leaves.

NOTES.—Plants grow especially in sandy soils, in fields, grassy places, along hills, roads, in vineyards along mountains. They are usually found on level land and in hilly country, though occasionally they have been found at an alt. of 2200 m. Plants occur often on cultivated land and are therefore generally called in German Kulturbegleiter. In cultivated lands where the plants occur abundantly bulbs are often spread by farm implements. This species is distributed through Central and Southern Europe, as far as Denmark and Southern Sweden, further through Asia Minor, Iran and Northern Africa. It is absent in the British Isles.

16. G. GRANATELLII Parl. Flor. Palermo 2:376; Terracc. Bull. Soc. Bot. France. Mem. 1905; *Ornithogalum Carovagli* Manby, Flor. Alg. 35.

DESCRIPTION.—Leaves lanceolate, flat. Segments of the perigone deep yellow, lanceolate-oblong, obtuse, on the back loosely pilose or glabrous. Peduncles villose seldom glabrous. Capsule oblong or obovate.

NOTES.—This species has the appearance of *G. arvensis.* It occurs in the mountains and fields of Tripolis, Cyrenaica and Algeria. There is a variety *maroccana* Terracc. Bull. Bot. France. Mem. 16, 1905 with larger bulbs. It is found near Tangiers and other parts of Morocco. Subsp. *Chaberi* Terracc. Bull. Soc. Bot. France. Mem. 16, 1905 with smaller bulbs is found in ravines and forests near Medeah.

17. G. BOISSIERI Pasch. Lotos N. F. 14:121, 1904; *G. foliosa* Boiss. Flor. Orient. 5: 205, 1881.

DESCRIPTION.—Bulbs small, often verrucose to arealate. Basal leaves linear, at the apex more or less attenuate. Cauline leaves somewhat opposite or distinctly alternate; the lowest oblong or oblong-linear, often nearly filiform, attenuate, the upper linear, short. Inflorescense compact, with few flowers, bracts narrow linear, 10 to 15 cm. long. Segments of the perigone obtuse, seldom subacute or oblong, nearly elliptic; inner segments narrow, obtuse. Capsule attenuate at the base.

NOTES.—This species is related to *G. arvensis.* It has been stated by Pascher that this species may be *G. dubia* Terracc. Bull. Ort. Bot. Pal. 39. Exsiccatae Callier, Iter. Lauric. II nr. 257.

18. G. FIBROSA Schult. Syst. 7; 552; Kunth, En. Plant. 4:243; *G. mauritanica* Cosson, Rev. Flor. Libycae in Bull. Soc. Bot. France 12:279; *G. rigida* Boiss. et Sprun., Diagn. Plant. Or. Ser. I. fasc. VII, 108; Munby, Cat. Plant. Alg. 1:32; *Ornithogalum fibrosum* Desfont., Flor. Atl. 1:294, Tab. 84; Poiret, Encycl. Method. Suppl. 4:193.

DESCRIPTION.—Leaves distinctly grooved. Segments of the perigone glabrous, seldom faintly pubescent. Pedicels sparcely pilose or somewhat pubescent. Capsule ovate-oblong, obtuse, one half the length of the perigone. Seeds triangular.

NOTES.—Native to the hills and calcarous fields of Tripolis and Egypt. Among the varieties are mentioned var. *latifolia* Terracc. and *angustifolia* Terracc.

19. G. MICRANTHA Pasch. Lotos N. F. 14.122-123, 1904, *G. foliosa* var. *micrantha* Boiss. Flo. Orient. 5:205.

DESCRIPTION.—Plants small more or less robust. Tunic ash colored, slender, stem robust. Basal leaves shorter than the inflorescence, linear at the apex hardly wider, toward the apex short attenuate, somewhat acute. 3 to 5 mm. wide, 15 cm. long. Cauline leaves alternate, seldom opposite; lower leaves oblong, at the apex attenuate to acute, 1.5 to 2 mm. wide, 1 to 2 cm. long. Inflorescence few to many flowered, flowers somewhat clustered. Bracts at the base of the pedicels, oblong-linear or somewhat filiform. Pedicels of unequal length, one half to 1.5 times length of the flower. Flowers 7 to 11 mm. long. Outer segments of the perigone oblong, at the apex a little attenuate, subacute or sub-obtuse, seldom toward the base attenuate, narrow, yellow bordered, near the base ciliate 1.5 to 2 mm. wide; inner segments oblong, at the base slightly attenuate or subobvate to oblong. Stamens one third of the perigone in length. Filaments scarcely dilatate at the base. Ovary obovoid, 3-sided, above somewhat emarginate; style scarcely half as long as the ovary; stigma retuse, slightly 3-lobed. Capsule as long as the perigone segments or slightly shorter, obovoid, obtuse, 3-sided with a remaining style. Var. *libanotica* Pasch. in Fedde Repert. 1:191, 1905 differs slightly from the species.

NOTES.—Native to Lebanon, Syria and surrounding territory. Exsiccata. Kotschy, Iter. Syr. 245, 1885.

20. G. PEDUNCULARIS (Presl.) Pasch. Lotos N. F. 14:114, 1904, Bull. Soc. Imp. Nat. Moscou, 356, 1905; *Ornithogalum pedunculare* Presl. Del. Prag. 150; *G. foliosa* Boiss. Flor. Orient. 5:205, 1881.

DESCRIPTION.—Basal leaves narrow, about 2 mm. wide, linear or somewhat filiform. Inflorescence few flowered. Flowers 14 to 26 mm. long. Segments of the perigone obovate-oblong, obtuse or somewhat rounded. Capsule arcuate.

NOTES.—This is a very variable species. Native to littoral Asia minor, Syria, Cyprus, Crete, Greece to Dalmatia.

21. G. ASSYRIA Terracc. in Bull. Soc. Bot. France 5:1122-1123, 1905.

DESCRIPTION.—Bulbs small. Basal leaves more or less filiform, not reaching the length of the flowers. Cauline leaves broad, shorter than the inflorescence, convolute toward the apex, long tapering, attenuate. Scape slender, striate, glabrous. Inflorescence many flowered. Pedicles villose, unequal. Flowers small, yellowish green, segments of the perigone lanceolate, acute, greenish on the dorsal side; distinctly veined. Stamens half the length of the perigone; filaments subulate, toward the base dilatate. Anthers oblong, small. Ovary oblong, 3-sided; style slender and often appearing above the anthers. Capsule obovate-oblong, 3-sided.

NOTES.—In woods of Mountain Tur Tschell, Assyria.

22. G. JULIAE Pasch. Lotos N. F. 14:123, 1904; *G. foliosa* var. *orientalis* Sinten. in exs.; *G. peduncularis* var. *orientalis* Pedch. in sched.

DESCRIPTION.—Plants slender, bulbs small. Tunic dark brown, fibres absent or at some distance surrounding the bulb. Stem often elongated, slender, circular on cross section, subangulose, attenuate at the base. Basal leaves narrow linear, 1 to 1.5 mm. wide, as long or longer than the flower cluster, the upper ones somewhat grooved, at the base slightly attenuate. Cauline leaves alternate, 1 to 2.5 cm. distance from each other; lower leaves 3 to 7 mm. wide and 3 to 5 cm. long; upper leaves linear, attenuate toward the apex, seldom slightly clasping around the stem. Bracts somewhat cilate. Pedicels of unequal length, elongating during the fruiting stage. Flowers small 3 to 9 cm. long. Outer segments of the perigone 7 to 9 mm. long; the inner ones often pilose, oblong, attenuate at the tip; the interior ones nearly obovate-oblong, at the apex attenuate. Stamens about one fourth the length of the perigone; filaments widened at the base. Ovary obovoid; style short. Capsule about one third of the length of the perigone, obovoid, arcuate, retuse, emarginate with a remaining style.

NOTES.—Native to Cyprus.

SECTION 2. **Monophyllos** Pascher, Lotos, n. ser. 14: 112. 1904. First and second leaves free, not surrounding the stem; each one having usually an erect bulb in its axil; the second leaf although present is mostly rudimentary.

Subsection 1. **Minimae** Pascher, Lotos, n. ser. 14: 112. 1904. Leaves narrow, linear, occasionally filiform, often angular.

23. G. MINIMA (L.) Ker.-Gawl. Journ. Roy. Inst. 1:180, 1816; *G. callosa* Reichb. Flor. Germ. Excurs. 107; *G. baumgartneriana* Schur. Enum. Plant. Transc. 667; *Ornithogalum minimum* Pall. Reise 2:14; *O. Gracile* Hagen Chlor. Boruss. 122; *O. Callosum* Kit. in Schult. Oesterr. Flor. ed. II, 1:557.

DESCRIPTION.—Bulbs small. Plants 8 to 20 cm. high, very slender. Flowering stem forming at the base a large and a small bulb. Basal leaf one, seldom a second one which is very short, narrow, 1 to 2 mm. wide, linear, flat to somewhat hollowed. Lower cauline leaf 7 to 8 mm. wide; often sword-like curved, shorter to longer than the flower cluster; upper leaf linear, resembling the basal leaf. Inflorescence umbel-like, 1 to 7-flowered. Pedicles glabrous, usually 2 to 3 times longer than the flowers. Segments of the perigone linear-lanceolate, 10 to 12, sometimes 15 mm. long, acuminate, slightly recurved. Stamens shorter or half the length of the perigone, Anthers elongated. Capsule ovate, shorter than the perigone.

NOTES.—This species is found along margins of forests, along slopes, under fruit trees, bushes, in alpine meadows. Occasionally in the Alps to 1600 m. alt. It prefers calcareous soils. Native to Southern and Eastern Europe, as far as Denmark and Scandinavia, is absent in Spain, France, Belgium and the Netherlands. It also occurs in Caucasia, Ural Mountains, Asia Minor, Siberia and the Altai Mountains.

24. G. MESOPOTAMICA Bornm. in Notizbl. Bot. Gart. Berlin 7:172, 1917.

DESCRIPTION.—Bulbs in two's. Tunic leathery, brownish. Basal leaves 1 to 2, glabrous; the majority reaching the flowers, linear, 1.5 mm. wide and 10 to 15 cm. long. Cauline leaves two, more or less opposite, glabrous or somewhat ciliate, oblong-lanceolate. Inflorescence density 4 to 7-flowered. Pedicels glabrous, somewhat of the same length, 2.5 cm. long erect. Segments of the perigone linear, narrow, about 1 mm. wide and 12 to 15 mm. long; the inner ones yellowish; the outer greenish, 3-veined. Filaments one third or one fourth the length of the perigone; anthers yellow, ovate. Stigma retuse not lobed.

NOTES.—Native to the steppes of Djirdjib-rud, Mesopotamia, at 400 m. alt. This species is apparently related to *G. minima.*

25. G. MINUTA Grossh. in Komarov, Flora U. S. S. R. 4:734, 1935.

DESCRIPTION.—Bulbs small, solitary. Tunic dark, fuscate. Stems 2 to 5 cm. long, slender, thin. Basal leaves solitary, linear, at the base not attenuate, 3 to 4 mm. wide, shorter or as long as the flower cluster. Cauline leaves short, linear. Inflorescence 1 to 4-flowered. Pedicels unequal, thin, 2 to 3 times as long as the flowers, somewhat crispulate villose, more or less glabrous. Segments of the perigone 7 to 9 mm. long, narrow-linear, acute, inside bright yellow, on the outside greenish. Anthers small, ovate-rotundate.

NOTES.—Native to the mountains of Buchara.

26. G. GRANULOSA Turcz. Bull. Soc. Imp. Nat. Moscou 26:2, 112.

DESCRIPTION.—Plants more robust than *G. minima,* about 14 cm. high. Leaves flat, veins clearly visible, attenuate, somewhat narrow sublanceolate. Flowers 14 mm. long. Pedicels 1 to three times longer than the flowers. Var. *elatior* Pasch. Fadde Repert. 1:33 is more slender, leaves are around 30 mm. long. Pedicels are more delicate.

NOTES.—Native to Altai Mountains and Turkestan. Under this species is sometimes included *G. rufescens* Regel, Index Semen Hort. Petrop. 128, 1863 which is a luxuriant horticultural form, having a height of about 20 cm.

27. G. MINIMOIDES Pasch. Lotos N. F. 14: 124, 1904.

DESCRIPTION.—Plants 15 to 20 cm. high. Bulbs two. Tunic membranaceous, brown. Stem slender, slightly angled. Basal leaves one, linear, attenuate at the base, somewhat grooved, innerside slightly reddish, 8 to 12 mm. wide, slightly longer than the flower cluster. Lower cauline leaf elliptic-oblong, attenuate, shorter than the inflorescence. Inflorescence with few flowers, loose. Bracts oblong-linear, at the apex attenuate-acute. Pedicels slender, 3 to 7 times longer than the flowers, often flexuous, slightly spreading. Flowers 9 to 13 mm. long, yellow; outer segments of the perigone oblong, attenuate at the top, somewhat acute, often narrow bordered; inner segments bordered, attenuate-acute, 1.5 to 2¼ mm. wide. Stamens one quarter the length of the perigone. Ovary obovoid, 3-sided, at the top somewhat emarginate; stigma slightly notched, scarcely 3-lobed. Capsule and seeds unknown.

NOTES.—Native to Iran.

28. G. HIENSIS Pasch. Lotos N. F. 14:125, 1904.

DESCRIPTION.—Plants small. Bulbs two. Tunic brown to dark brown. Stem 3 to 7 cm. long, attenuate at the base. Basal leaf longer than the inflorescence, slightly attenuate at the base, scarcely attenuate toward the apex, 1.5 to 5 mm. wide, somewhat grooved. Lower cauline leaf somewhat convave, grooved at the base, oblong-linear, gradually attenuate, shorter than the flower cluster. Inflorescence few flowered. Bracts more or less filiform. Pedicels 2 to 4 times longer than the flowers, slender. Flowers 8 to 11 mm. long, yellow, here and there reddish. Outer segments of the perigone oblong or obovate-oblong, obtuse, 4 to 5 times longer than wide; inner segments wider bordered, usually a little narrower, obtuse. Ovary obovoid, attenuate at the base; style about twice as long.

NOTES.—Native to Turkestan.

29. G. INTERCEDENS Pasch. in Fedde Repert. 1:192, 1906.

DESCRIPTION.—Plants robust, 7 to 10 cm. high. Bulbs firm. Tunic dark violet. Basal leaves linear, at the base attenuate. Cauline leaves more or less opposite, surrounding the stem at the base, broad oblong, attenuate-acute. Inflorescense many flowered. Bracts linear to filiform. Pedicles double the length of the flower, occasionally shorter, glabrous. Flowers 12 mm. long. Outer segments of the perigone, oblong, obtuse, narrow limbate; inner segments obovate-oblong. Stamens one third as long as the perigone; filaments at the base somewhat dilatate. Ovary 3-sided, obovoid; stigma more or less capitate or 3-lobed.

NOTES.—Native to Sultanabad, Iran. This species seems to form a connecting link between *G. filiformis* and *G. luteoides.*

30. G. CONFUSA Terracc. Boll. Soc. Ort. Palermo 2:1904, Bull. Herb. Boiss. 5: 1066, 1905.

DESCRIPTION.—Bulbs large, numerous ones are formed at the base. Basal leaves solitary, broad lanceolate-linear, distinctly veined; reaching the flowers, attenuate at the base. Cauline leaves surrounding the base of the stems, distinctly veined. Inflorescence few and loose flowered. Pedicels glabrous erect. Flowers small, yellowish green. Segments of the perigone obovate-lanceolate or elliptic, acute, with translucent margins. Filaments filiform, dilatate at the base; anthers small, oblong. Ovary small, obconic, afterwards obovoid to 3-sided.

NOTES.—Native to northern Iran. The flowers appear soon after the melting of the snow. They grow to an alt. of 2400 m.

Subsection 2. **Luteoidae** Pascher, in Bull. Soc. Nat. Moscou 361. 1905. Basal leaves thick, somewhat terete, linear; capsule broad obcordate to oval-oblong, nearly as long as the perigone.

31. G. LUTEOIDES Stapf. in Denkschr. Akad. Wiss. Wien. 1:80, 1885.

DESCRIPTION.—Basal leaves single, broad lanceolate, more or less sickle-shaped, at the base attenuate, toward the apex acute, reaching the flowers. Cauline leaves opposite, of unequal length, lanceolate-falcate, surrounding the stem at the base. Inflorescence umbel-like, single or few flowered. Pedicels slender, glabrous. Segments of the perigone small, lanceolate, acute, glabrous, 3-veined. Filaments one fifth the length of the perigone; anthers round. Ovary oblong or obovate-conical; style slender. Capsule obovate-oblong.

NOTES.—Native to Iran and the mountains of Nemrud Dagh, Mesopotamia. It has been claimed that this species stands between *G. assyrica* and *G. micrantha.*

Subsection 3. **Fistulosae** Pascher, in Lotos, n. ser. 14: 125. 1904. Leaves round tube-like; capsule broad, obcordate to obovoid-oblong, about as long as the perigone or shorter.

32. G. FISTULOSA (Ram.) Ker.-Gawl. Journ. Roy. Inst. 1:80, 1816; *Ornithogalum fistulosum* Ram. ex DC. Flor. Fr. 3:215.

DESCRIPTION.—Bulbs large. Basal leaves ternate, fistulose, often elongate. Cauline leaves more or less opposite, lower leaf very much concave, ovate, above hood-like contracted. Inflorescence umbella like. Pedicels several times longer than the flowers. Flowers 16 to 21 mm. long. Segments of the perigone oblong or obovate-oblong, toward the apex slightly attenuate, obtuse or rotundate-obtuse. Here belong var. *eufistulosa* Pasch. and var. *De-Candolleana* Pasch.

NOTES.—Native to Caucasia, Asia Minor; in the mountainous areas of Syria, Turkestan and Altai.

33. G. SAMOJEDORUM Grossh. in Komarov, Flora U. S. S. R. 4: 84, 1935.

DESCRIPTION.—Bulbs ovate. Tunic gray with numerous fibers. Stem 8 to 18 cm. high, slender, fistulose. Basal leaves lanceolate, toward the apex becoming narrow, at the base dilatate, 7 to 8 mm. wide. Inflorescense one to two, sometimes three flowered. Pedicels almost equal, long, glabrous. Segments of the perigone 14 to 15 mm. long, oblong-elloptic, obtuse, toward the apex somewhat angustate, yellow. Anthers half as long as the perigone.

NOTES.—Native to the meadows and calcareous soils of Petshora, U. S. S. R. This species is related to *G. fistulosa* though it is more slender and the flower clusters are composed of less flowers.

34. G. MIRABILIS Grossh. in Komarov, Flora U. S. S. R. 4:736, 1935.

DESCRIPTION.—Bulbs ovate, often small. Tunic dark brownish, leathery. Stems 8 to 15 cm. high, fistulose, below the inflorescence to 4 mm. thick. Basal leaves solitary, fistulose, 2 to 4, seldom 5 mm. in diameter, reaching somewhat above the inflorescence, linear, at the apex attenuate. Cauline leaves smaller, lanceolate, at the base surrounding the stem, 10 to 12 mm. wide, angustate at the apex, as long or shorter than the flower cluster. Inflorescence more or less umbellate, 2 to 6-flowered. Pedicels almost equal, about 3 to 4 times longer than the flowers. Segments of the perigone 10 to 12 mm. long, lanceolate-oblong, at the apex attenuate or acute, light yellow, on the outside greenish. Stamens half as long as the perigone segments; anthers oblong. Capsule 1.5 to 2 times shorter as the perigone, obovate, toward the apex emarginate.

NOTES.—Native to Northern Kasakstan. Type specimen from prov. Aktjubinsk, Mugodshary, prope Ber-Tschogur. This species is related to *G. anisanthos* C. Koch from which it mainly differs by its dark brown tunic.

35. G. SINTENSIS Pasch. Lotos N. F. 14: 125, 1904.

DESCRIPTION.—Bulbs two. Tunic black or dark brown, suberect, stem at the base attenuate, somewhat angled. Basal leaf one, double the length of the inflorescence, rounded to flat, fistulose, attenuate at the base. Cauline leaves more or less opposite or alternate, lower leaves concave to grooved, at the base slightly clasping around the stem. Inflorescence few flowered. Bracts somewhat filiform. Pedicels longer than the flowers. Flowers 9 to 13 mm. long. Outside segments of the perigone slightly attenuate at the apex, subacute to acute; inner ones narrower, 1.5 to 2 mm. wide. Stamens one third to one quarter of the length of the perigone; filaments subulate. Ovary obovoid, above notched, slightly emarginate; style double the length of the ovary; stigma slightly expanded. Capsule obovoid, emarginate of various lengths.

NOTES.—Native to the region of the Euphrates. Exsiccatae, Sintensis, Exciss. Iter. Or. 1889 as *G. liotardii.*

36. G. SPATHACEA (Hayne) Salisb. in Kon. et Sims, Ann. Bot. 2:556, 1806; G. belgica Dum. Flor. Belg. 139; Ornithogalum spathaceum Hayne

in Asteri, Ann. Bot. 21:11, 1797; *O. Heynii* Roth in Roem. Arch. 3:42; *O. belgicum* Lej. Rev. Flor. Spa 67.

Description.—Bulbs two, roundish-egg-shaped, of unequal length. Plants occasionally to 20 cm. high. Basal leaves two occasionally three, linear to filiform, hardly 1 mm. wide, half round, above hollow or flat, veins faintly visible on the lower surface. Lower cauline leaf 6 to 9 mm. wide, as long or shorter than the flower cluster; upper cauline leaf linear-lanceolate. Inflorescence umbel like, 1 to 5-flowered. Pedicels glabrous, usually two to three times longer than the perigone. Segments of the perigone long-lanceolate, 10 to 12 mm. long, obtuse.

Notes.—This species prefers shady situations, especially forests that are rich in humus and moist shrubby low lands. From north Atlantic and is common through Central Germany, Denmark, Sweden and southern Norway. It is rare in the Netherlands, more common in Belgium, is absent in Austria and Switzerland.

37. G. joannis Grossh. In Komarov, Flora U. S. S. R. 4:734, 1935.

Description.—Bulbs small, secondary bulbs small, foveolate-regulose, dark. Tunic leathery. Stems 3 to 10 cm. high. Basal leaves single, about 1.5 times longer than the flower cluster, narrow-linear, fistulose, 1.5 to 2 mm. wide. Cauline leaves single, lanceolate, as long or somewhat longer than the inflorescence. Inflorescence few flowered. Pedicels thin, 2 to 3 times longer than the flower. Segments of the perigone yellow, greenish on the dorsal side, 9 to 10 mm. oblong-lanceolate, obtuse. Filaments half the length of the perigone; anthers ovate-roundish. Capsule obovate-oblong, slightly shorter than the perigone.

Notes.—Native to Southern Transcaucasia, Armenia and the Rep. Nachiczhevan growing in alpine regions. It is related to *G. spathacea.*

38. G. dschungarica Regel in Act. Hort. Petrop. 6; 513.

Description.—Plants small, robust, 6 to 9 cm. high. Basal leaves linear, 10 mm. wide, attenuate toward the base, somewhat hooded or cucullate toward the apex, slightly grooved, inner side more or less reddish. Cauline leaves much shorter than the flower cluster, surrounding the base, attenuate below. Inflorescence articulate. Flowers 4 to 8 mm. long. Segments of the perigone oblong-lanceolate, obtuse, 6 to 7 mm. long. Anthers roundish. Stigma small, faintly 3-lobed.

Notes.—Native to Turkestan, Dsungaria and Iran at an alt of 1800 to 2100 m.

39. G. vaginata Pasch. in Fedde Repert. 2:58.

Description.—Tunic dark brown. Basal leaves narrow linear, somewhat grooved. Cauline leaves very much concave, surrounding the stem at the base, oblong, the apex contracted near the middle. Inflorescense 2 to 3-flowered, very short. Flowers 8 to 11 mm. long. Segments of the perigone oblong, ovate oblong, somewhat obtuse. Stamens one third the length of the perigone. Filaments at the base slightly dilatate. Ovary obovoide, 3-sided; style longer than the ovary. Capsule unknown.

Notes.—This species is closely related to *G. dschungarica.* It is native to Japan.

[To be continued in PLANT LIFE Vol. 16, 1960.]

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THE EVOLUTION OF GENETIC SYSTEMS, by C. D. Darlington. Revised and enlarged edition. Basic Books Inc., New York: 1958. Pp. 265. Illus. $5.50.

After a lapse of about 20 years Professor C. D. Darlington has revised his little book, "The Evolution of Genetic Systems". The revision is larger than the original (265 compared to 149 pages), and chapters have been added on, "The Management of the Cell," "Types of Plasmagenes", "Heredity and Infection", and "Initiative in Evolution".

It is not clear to what audience the message in this book is directed. But it is abundantly clear that it is not intended for the socalled, "intelligent layman". Probably graduate students in biology, professional biologists, biochemists, and biophysicists, would derive the most benefit from contact with Prof. Darlington's ideas, but even here a good working knowledge of genetics and cytology will be necessary for understanding the essentials of his arguments.

It seems fair to assume that this book represents the latest views of Prof. Darlington on contemporary problems in genetics, cytology and evolution. If so, he has not taken the trouble to integrate his thoughts with many of the modern discoveries in these disciplines. For example, the important work of McClintock on genic expression as related to chromosomal organization goes unmentioned. The same is true of the ingenious and significant research of Sears with wheat. Likewise, the experimental work in radiation cytology by Swanson and others cannot be dismissed entirely when one is concerned with the evolution of genetic systems. It would appear to be almost impossible to write an up-to-date book on the subject Prof. Darlington has chosen, and at the same time ignore Anderson's work on introgressive hybridization or the many contributions of G. L. Stebbins, Jr., to current evolutionary thought. Darlington has managed to turn the trick, but the book is much the poorer as a result of these omissions. The examples cited are by no means a complete list of important work of the past decade that has been overlooked or neglected. But they will suggest that the reader can expect to be served a highly selective dose of Prof. Darlington's "free-wheeling imagination" and "colorful writing" (quotes from the dust jacket).

Of the 317 references, about 62 percent were published prior to 1950. Most of the figures have been carried over from the original version, but several new ones have been added. The text is singularly free of annoying typographical errors and there is a good index of about 11 pages.

The critical reader of this revision will be repaid for his efforts with a number of new ideas, along with a great deal of speculative discussion and valuable information. Prof. Darlington has the knack of devising plausible hypotheses that knit together what appear to be widely unrelated biological phenomena. Some of these hypotheses will undoubtedly be rejected as more information becomes available while others may withstand the test of time, but it is reasonable to anticipate that all of them will serve the useful purpose of stimulating more discussion and research into basic biological problems.—*Thomas W. Whitaker, U. S. Department of Agriculture, La Jolla, California.*

PRINCIPLES OF GENETICS, by E. W. Sinnott, L. C. Dunn and T. Dobzhansky. 5th ed. McGraw-Hill Book Company, Inc. New York. 1958. Pp. 459. Illus. $6.75. Users of previous editions of this standard textbook of genetics will hardly recognize the 5th edition. A change in format to the 2-column page has resulted in a slightly more bulky book, but the present edition is shorter by almost 50 pages. However, these are not the most important changes. The new edition has been completely rewritten and brought abreast of current research in genetics, while still retaining the proper emphasis upon fundamentals.

There are almost twice as many chapters in the new book compared to the 4th edition (18 vs 29). The new chapters are concerned with such topics as, "Varieties of sexual reproduction"; "Physiological genetics"; "The genetic control of development"; "The elements of the genetic system"; "Organization of the genetic material" etc. The last chapter "Statistical inference in genetics", by Prof. Howard

Levene, is a clear, well-written treatise of the statistical ideas and methods necessary for treating and exploiting the significance of genetic data. Concentration of the statistical matter in one chapter is a vast improvement in arrangement over scattering such material piece-meal throughout the book as happened in the 4th edition. The authors point out in the Preface that the study of Chapter 29 (Statistical inference in genetics) should commence immediately and run concurrently with the progress of the student through the book after the contents of the two introductory chapters have been mastered.

One of the best features of previous editions, the "Problems" or "Questions for Discussion" at the end of each chapter have been retained and improved. It has been said that genetics is essentially a problem-solving science. It therefore behooves the student of heredity to make an early start in becoming acquainted with the application of genetic principles to practical and theoretical questions.

An Appendix consisting of Mendel's classical paper "Experiments in plant hybridization", should be read, not only by embryo geneticists, but by all students of biology. This masterpiece of experimental work and deductive reasoning could appropriately be included in the table of contents of all textbooks of genetics.

From cover to cover this is an exceptionally attractive book. The figures are uniformly excellent, especially the reproductions of photographs. The printing is clear, neat and easy to read, while there is a marked absence of the usual glaring typographical errors. The book concludes with an annotated bibliography and an index. The bibliography consists almost entirely of reference works collected under the appropriate chapter headings; generally a dozen or more for each chapter. Citations to original papers can be found in many of these reference books should they need to be consulted.

This book will undoubtedly attract and hold the attention of the serious student who seeks to know and understand the facts of heredity and variation. At the same time it will be of immense aid, as well as a stimulus and inspiration to the conscientious teacher.—*Thomas W. Whitaker.*

FIFTY YEARS OF BOTANY, edited by W. C. Steere. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 1958. Pp. 638. Illus. $10.00. This Golden Jubilee Volume of the Botanical Society of America is the cooperative effort of more than forty authorities. The forty articles beginning with the early history of the Botanical Society of America include special invitational papers of broad and general interest that appeared in Vols. 43 and 44 of the American Journal of Botany, and also six papers on the progress and outstanding achievements in various fields of plant science during the past fifty years. This is a book that all who are seriously interested in plant science must have. Highly recommended.

PLANT BREEDING AND CYTOGENETICS, by F. C. Elliott. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 1958. Pp. 395. Illus. $8.50. This stimulating volume deals primarily with the fundamental principles and the evaluation of the newer methods in plant breeding by an outstanding authority in the field. Some background in genetics on the part of the reader is assumed, and the text will appeal more to advanced students and breeders than to beginners. Highly recommended.

COMMERCIAL FRUIT AND VEGETABLE PRODUCTION, by W. V. Cruess. 4th ed. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 1958. Pp. 884. Illus. $15.00. This revision of the standard work in this field is based on forty years of lecturing by the author, and is designed for college lecture courses on fruit and vegetable products and will serve also as an outstanding reference work on principles and production methods for canners, freezers, juice producers, preservers, and other food processors. This 4th edition includes much new material. Highly recommended.

HANDBOOK OF BASIC MICROTECHNIQUE, by Peter Gray. 2nd ed. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 1958. Pp. 252. Illus. $6.00. This revised and enlarged edition was written as an elementary text on the preparation of plant and animal tissues for microscopic examination with examples taken from bacteriology, pathology and also from general zoology and plant science. It includes a section on the microscope and elementary photomicrography which is new, a second section on the preparation of microscope slides, and the third section on specific examples of slide making. Highly recommended.

COMMERCIAL FLOWER FORCING, by A. Laurie, D. C. Kiplinger and K. S. Nelson. 6th ed. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 1958. Pp. 509. Illus. $9.50. This is the 6th revision of the outstanding text on all phases of flower growing under glass, including culture, marketing and cost accounting. It is designed for college courses in floriculture, and also for the commercial grower. On pages 311-312, the vegetative method (cuttage) of Amaryllis is omitted (see Traub, Amaryllis Manual. 1958), and only one species is mentioned, although there are more than forty species, and many outstanding hybrids. The mention of these omissions, which can be included in the next edition, should not be construed as a criticism of the text as a whole which is excellent and highly recommended.

THE ART OF DRYING PLANTS AND FLOWERS, by Mabel Squires. M. Barrows & Co., 425 4th Ave., New York 16, N. Y. 1958. Pp. 258. Illus. $4.50. This is an outstanding practical book on drying plants. The first part concerns the kinds of plants to dry and where they may be obtained; the second part gives directions for gathering and drying flowers, foliages, nuts, seed pods and cones; and the third part is devoted to the uses of dried plant materials. This book will be welcomed by those interested in flower arrangements, and home decoration.

THE SWIMMING POOL, by Robert Scharff. M. Barrows & Co., 425 4th Ave., New York 16, N. Y. 1958. Pp. 214. Illus. $3.50. This is a comprehensive book on the construction, care and maintenance of swimming pools, including also suggestions for landscaping the pool, and for the uses of pools. This book will be welcomed by the many who plan to build a pool.

THE FLOWER ARRANGEMENT CALENDAR, 1959, by Helen Van Pelt Wilson. M. Barrows & Co., 425 4th Ave., New York 16, N. Y. The publishers sponsor an annual flower arrangement calendar contest. In this little book some of the photographs of floral arrangements accepted by the publishers are reproduced in calendar form for 1959. This calendar will be useful to those interested in flower arranging.

PHYSIOLOGY OF FUNGI, by V. W. Cochrane. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1958. Pp. 524. Illus. $9.75. This important new book is concerned with the fungi from the standpoint of comparative biochemistry, including the filamentous fungi and actinomycetes and those researches on the yeasts that have direct bearing on the physiology of the true fungi. Highly recommended to students and research workers in all fields of microbiology.

CHEMICAL TRANSFORMATIONS BY MICROORGANISMS, by F. H. Stodola. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1958. Pp. 134. Illus. $4.25. This stimulating book summarizes information on three main types of research in microbiological chemistry,—the chemical composition of microorganisms, the organic type reactions they carry out, and their synthetic powers. Among the new and useful chemicals produced by microorganisms which are discussed, the section dealing with gibberellins is of particular interest to those interested in crop plant production. Highly recommended.

THE GENETIC BASIS OF SELECTION, by I. M. Lerner. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1958. Pp. 298. Illus. $8.00. This stimulating book is based primarily on detailed data from poultry genetics, but the subject is presented in such a manner that the principles discussed may be applied to other species. The emphasis is placed necessarily on artificial as against natural selection in diploid sexually reproducing populations on the intraspecific level. The book is designed for readers who have a thorough knowledge of modern genetics but who lack an extensive background in mathematics and statistics. Highly recommended.

THE ECOLOGY OF INVASIONS BY ANIMALS AND PLANTS, by C. S. Elton. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1958. Pp. 181. Illus. $5.25. This stimulating book brings together the author's ideas from the fields of faunal history, ecology and conservation with which he has been concerned for more than thirty years. He gives concrete examples of the advance of invading species of animals and plants that affect the balance between populations thus leading to the

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THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

I. THE AMERICAN AMARYLLIS SOCIETY

[Affiliated with the American Plant Life Society]

[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

(c) REGISTRATION OF PLANT NAMES

Registrar: Mr. W. D. Morton, Jr., Registrar of Amaryllis Names.

Correspondence about the registration of plant names should be sent directly to Mr. Morton, 3114 State St., New Orleans, La. and a self-addressed, stamped envelope should be enclosed if a reply is expected.

(d) AMARYLLID SECTIONS

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1. **AMARYLLIDACEAE: TRIBE AMARYLLEAE,** by Traub & Moldenke (including the genera Amaryllis, Lycoris, Worsleya, Lepidopharynx, Placea, Griffinia, and Ungernia; Manila covers; 194 pages, incl. 18 illustrations. $5.00 postpaid.
This is required reading for every amaryllid enthusiast.

2. **DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948,** by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $2.50 postpaid.

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A GUIDE TO THE HISTORY OF BACTERIOLOGY, by T. H. Grainger, Jr. Ronald Press Co., 15 East 26th St., New York 10, N. Y. 1958. Pp. 210. Illus. This guide, consisting of selected lists of reference sources, is designed for use in the course "History of Microbiology" offered at Lehigh University. Following the introduction, there are selected references to the literature: (a) bacteriology, (b) the history of bacteriology, (c) biological references, and (d) biographies of selected bacteriologists.

ZEN IN THE ART OF FLOWER ARRANGEMENT, by G. L. Herrigel. Chas. T. Branford Co., 69 Union St., Newton Centre 49, Mass. 1958. Pp. 124, Illus. $3.00. This is a translation by R. F. C. Hull of the German text with an introduction by D. T. Suzuki, and provides a concise and artistic description of the methods by which Zen can be taught. The subject matter is grouped under headings: the instruction, the master, the technique, the flowers way, the ceremony, and the substance of the teaching. Highly recommended to all interested in Japanese culture, and particularly in flower arrangements.

AN INTRODUCTION TO THE PLANT KINGDOM, by N. H. Russell. C. V. Mosby & Co., 3207 Washington Blvd., St. Louis 3, Mo. 1958. Pp. 353. Illus. $3.50. This clearly written and concisely presented text is designed for those who teach. and for students who pursue one-semester elementary botany courses. After an introductory section on the plant kingdom, there are sections on algae, fungi, mosses and liverworts, lower plants and flowering plants. Highly recommended.

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